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CAPITAL AND OPERATING COSTS OF POLLUTION CONTROL EQUIPMENT MODULES. VOLUME I. USER GUIDE

Herbert G. Blecker, et al

ICARUS Corporation

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CAPITAL AND OPERATING COSTS OF POLLUTION CONTROL EQUIPMENT MODULES

Volume I

User Guide

by

Herbert G. Blecker
Dr. Theodore W. Cadman

Contract No. 68-01-0717
Project 21AQJ
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Project Officer

Dr. Fred H. Abel
Economic Analysis Branch
Implementation Research Division

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This report has been reviewed by the Environmental Protection Agency and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

ABSTRACT

This USER'S GUIDE describes the scope of the cost manual, CAPITAL AND OPERATING COSTS OF POLLUTION CONTROL EQUIPMENT MODULES. Illustrative examples are given enabling the user to prepare estimates of conceptual environmental protection processes using the companion conceptual environmental protection processes using the companion Data Manual. Emphasis is placed upon the determination of the installed and annual costs of individual process equipment modules, determination of the installed and annual process costs, and evaluation of the potential process profitability in those cases where profit is a motive.

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SECTION I

CONCLUSIONS

1. The manual, CAPITAL AND OPERATING COSTS OF POLLUTION CONTROL EQUIPMENT MODULES (hereafter called ENVIRONMENTAL PROTECTION COST MANUAL), comprising this USER GUIDE and companion DATA MANUAL enables the user not expertly skilled in the particular technical field of cost engineering/process economics to prepare reasonable conceptual cost estimates for proposed environmental protection flow processing facilities. The easily used graphical and tabular format used for the presentation of data enable the user to rapidly evaluate alternative cost/process decisions for proposed environmental protection flow processing facilities.

2. Using the methods and data in this USER GUIDE and companion DATA MANUAL, estimates of costs within 10 percent of actual constructed facility costs were obtained.

SECTION II

RECOMMENDATIONS

Based upon the results obtained in preparing this ENVIRONMENTAL PROTECTION COST MANUAL, it is recommended that the following action be taken by the Environmental Protection Agency:

- The technique of preparing comprehensive cost engineering data using a computerized detailed estimating system for this ENVIRONMENTAL PROTECTION COST MANUAL as applied to the installed equipment item module costs should be extended into the environmental protection process area. This ENVIRONMENTAL PROTECTION COST MANUAL has directed its efforts primarily toward the development of comprehensive cost engineering data on individual installed equipment item module costs which can be cumulatively developed into a proposed environmental protection flow processing facility cost. This same technique can be applied in developing overall process costs as a function of effluent guideline, regional location, etc.

- A procedure should be implemented so that the data in the DATA MANUAL is updated on a bi-annual basis. The cost engineering relationships in the DATA MANUAL are based upon 1972 technology. Technology in the construction industry is rapidly changing and it is recommended that these changes be tracked by bi-annual updates to the DATA MANUAL.

- Training courses in the utilization of the cost engineering information and methods presented in this MANUAL should be implemented and offered to technical personnel evaluating this type of information at the regional and headquarters level.

- The DATA MANUAL should be expanded to include additional installed equipment item module costs representing the new pollution control technology developed during the course of the development of the DATA MANUAL but not considered in the initial contract.

SECTION III

INTRODUCTION

The task of environmental protection is characteristically a multi-faceted undertaking. A variety of social, economic and legal considerations must be merged with available or anticipated technology to first establish a set of potential strategies. Next, steps must be taken to establish a common measure of comparison among the strategies. Subsequent efforts may then concentrate on the formulation of an objective function for the protection endeavor and on the critical examination of available strategies to select the optimum strategy. Finally, plans must be initiated and carried out to achieve the implementation and enforcement of this selected strategy.

The relative emphasis given to each aspect of this basic methodology as well as the detail to which each is executed understandably varies at each level of potential influence - be it government, industry, or the public. Thus at the government policy establishment level, overall social, economic, legal, and technological interactions tend to predominate; while a local industry would desire to maintain or perhaps even enhance its own economic position.

Therefore, costs and, in particular, a cost manual, CAPITAL AND OPERATING COSTS OF POLLUTION CONTROL EQUIPMENT MODULES (hereafter called an ENVIRONMENTAL PROTECTION COST MANUAL) may carry a variety of connotations depending upon the level at which it is visualized. In this Manual, the viewpoint is fixed at the level of the individual environmental protection process and its cost engineering sub-elements. The primary objective of the Manual is to permit the rapid evaluation of the fixed capital cost and, subsequently, the annual process cost and potential profitability, if applicable, of the particular environmental protection flow process being evaluated. As such, it is intended primarily for the estimation of environmental protection implementation costs in the flow processing industries and for evaluations of proposed environmental protection processes such as are invariably required during the implementation and enforcement phases of environmental protection.

Regardless of its complexity, each flow process is composed of a sequence of individual processing steps in which changes in matter and/or energy are carried out. Each processing step in turn is accomplished by using one or more items of equipment arranged according to some processing scheme.

Closer examination reveals that the individual items of equipment used are rather limited in number and customarily require similar piping and ductwork arrangements, instrumentation schemes, electrical hookup, concrete foundations and footings, structural steel supports and structures, insulation, paint, and associated contractor indirect costs, regardless of the application.

As a result, the individual equipment item together with its usual accessories describes rather uniquely, a component part - called an installed equipment module - of any process. Because of the finite number of equipment modules, it is feasible to develop installed cost data for each. The total process cost may then generally be estimated from the sum of the individual installed equipment module costs making up the process.

Thus, whereas generality of costs at the process level is feasible on only a process by process basis, it is feasible to generalize the estimation of the installed costs of most environmental protection processes by first going to the basic cost engineering level of the individual equipment modules.

PURPOSE OF THE ENVIRONMENTAL PROTECTION COST MANUAL

The ENVIRONMENTAL PROTECTION COST MANUAL has been developed on the basis of the stated principle with the following primary purposes in mind.

The first purpose is to present, in convenient easily used graphical and tabular form, the installed costs of individual equipment item modules and the associated customary accessories in 1972 dollars. Equipment items used in both industrial and municipal environmental protection flow processes have been reviewed and appropriate equipment item modules defined so as to be able to describe the installed individual equipment item costs plus all the associated costs for the particular equipment items. The installed cost of each equipment module has then been evaluated over the range of potential application using the computerized detailed cost engineering system, CØ$T®, (Cost Oriented Systems Technique) described in Section V. The installed cost of each installed equipment module in each of the ten standard federal regions has been evaluated and presented in graphical form as a function of a key cost parameter such as size, area, capacity, horsepower, design flow, etc. In addition, adjustment factors to the installed cost for other than "norm" or typical operating conditions, materials of construction, and equipment design types are provided for many of the equipment modules including pumps, heat exchangers, vessels, towers, etc. A detailed discussion of each of the above equipment module characteristics are to be found in subsequent chapters of this User Guide and in the Data Manual.

The second purpose of the Manual is to present the methodology for estimating the capital equipment cost of environmental protection flow processes using the individual installed equipment module costs. Two processes are selected to illustrate the techniques used and are presented in a later section of this User Guide.

The third purpose of the Manual is to present the cost engineering methodology for estimating the annual cost and potential profitability of environmental protection processes. Elements of engineering economics, including depreciation, tax credit, process worth, rate of return, etc., are reviewed and then illustrated by example.

SCOPE OF THE ENVIRONMENTAL PROTECTION COST MANUAL

The ENVIRONMENTAL PROTECTION COST MANUAL is a convenient, easily used tool for use in the estimation of:

1. the installed cost of individual equipment modules,

2. the annual cost of individual equipment modules,

3. the installed cost of environmental protection flow processes,

4. the annual cost of environmental protection flow processes, and

5. the venture worth of environmental protection flow processes which may exhibit profitability.

Application of the data, methodologies, and cost engineering techniques presented in the Manual presupposes that the user has prepared an equipment item list for the environmental protection flow process under consideration. This list should be complete with the value of all key equipment parameters, operating conditions, and materials of construction as required to use the graphical and tabular data in the Data Manual. In addition, prior knowledge of costs not directly associated with the installed equipment item module costs, including the cost of raw materials, waste disposal, land, etc., is required to estimate total annual cost. Similarly product selling prices, sales and marketing expenses, state and local taxes, etc., must be available for a complete description of process worth and profitability. The exact nature of the additional data required for each case is detailed in the respective chapter of this User Guide and is illustrated by discussion and example.

The data presented in this Manual summarizes in convenient graphical and tabular form cost data available from the computerized cost simulation system, CØ$T®. As such, it represents the best averages of equipment item costs known to be available for 1972. From past experience, encompassing over sixty trial evaluations by U.S. companies in the flow processing industries, deviations from actual constructed plant costs have varied from -10 to +15 percent. Despite this, possible variation among vendor's quotations and contractor estimates must be clearly recognized and the data and cost engineering methodology presented in this User Guide and companion Data Manual recognized to be only a reasonable conceptual estimate of environmental protection flow process cost.

The installed costs of the equipment modules presented in the Data Manual have been developed utilizing average soil loadings, wind loadings, and soil types for each of the ten EPA regions. In addition, all equipment items were considered to be in flow processing schemes having typical or "norm" plot plan complexities and typical associated piping, instrumentation, concrete, steel, electrical, insulation, paint, and indirect costs. Estimates prepared using the ENVIRONMENT

PROTECTION COST MANUAL thus do not represent an actual facility or contractor's estimate where the plot plan may be other than norm, wind loadings different from what is average in the region, labor productivity other than the average productivity during 1972, soil types different from what is typical for the region's topography,or any other variables affecting the cost engineering relationships significantly different from those used in development of the installed equipment modules. In other words, utilization of the ENVIRONMENTAL PROTECTION COST MANUAL, while suitable for evaluating conceptual and alternative processing schemes for a particular environmental protection flow process, and for determining costs of a facility under average conditions of labor productivity, topography, etc. in a particular region, is unsuitable for comparison to an actual contractor's estimate or facility cost for an "atypical" location. In addition,the productivities for labor used in developing the labor portion of the installed equipment item cost modules assume a grass roots or add-on (modified) facility. If the user of the Data Manual is exploring a process where work will be done next to or within existing operating units, allowances should be made for an actual substantial decrease in productivity since field labor personnel on the construction project will have to spend considerable time obtaining work permits, safety permits, and work clearances from plant operating and safety personnel. These decreases in overall field labor productivity may be in the order of 50 to 75 percent and could change costs by a corresponding 25 to 50 percent.

REVIEW OF COST ESTIMATING TECHNIQUES

Estimating methods can be generally divided into two basic categories: the definitive estimate and the conceptual estimate.

The estimating procedure for preparing definitive estimates is very detailed and time consuming. In the definitive estimating method, drawings are prepared for all equipment items in the environmental protection flow processing facility, equipment foundations, buildings and structures, piping runs and outfall lines and all other cost engineering items required to definitively scope the work.

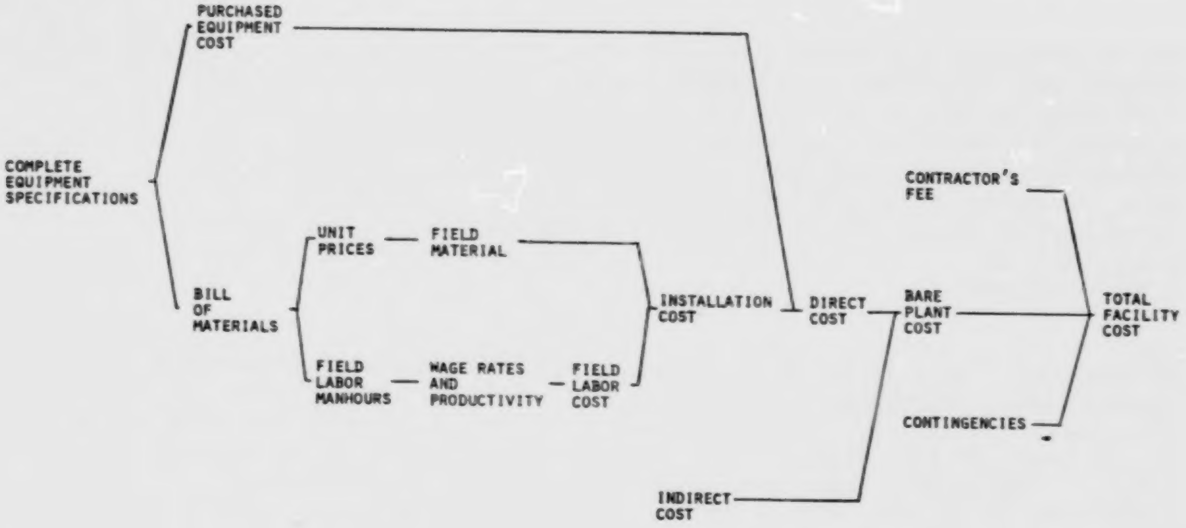
As shown in Figure 1, the task is first broken into two principal categories: collecting purchased equipment costs from vendors and determining the installation costs. For the evaluation of installation costs, further breakdown into material and labor categories is required.

Material takeoffs are prepared from the drawings. These material takeoffs consist of accurate, manually tabulated material quantities from the prepared drawings. Material quantities are tabulated for piping (e.g. fittings such as valves and elbows, tees, couplings),concrete (e.g. square feet of plywood forms for the foundations, pounds of steel reinforcements, sand,ready mix, etc.), instrumentation (e.g. pressure indicators, temperature indicators, flow recording controllers, pH indicators, etc.) and all the other field material quantities. These field material quantities,or bulk items as they are called in the construction trade, must be tabulated accurately so that a bill of material can be developed and material costs determined for each of the material quantities derived in the material takeoff.

In conjunction with determining these material quantity costs, labor manhours, derived from return costs of similar and like type construction projects, are used to determine the amount of field labor manhours necessary to install each of these material quantities. Field labor manhours are determined for each individual material quantity.

Adding the purchased equipment cost, material quantities, costs, and labor manhours multiplied by wage rates and productivities for a specific area (region) determines the total direct field costs. This direct cost is thus the cost,including all material and labor costs, to install the equipment item on site.

Direct costs, however, do not include the costs associated with the contractor's engineering and construction overhead costs. These additional costs are called indirect costs. Prime contractor's engineering is estimated as a function of the job size, equipment item and equipment mix, process complexity and field material costs. The construction overhead


PURCHASED EQUIPMENT COST
COMPLETE EQUIPMENT SPECIFICATIONS
BILL OF MATERIALS
UNIT PRICES
FIELD MATERIAL
FIELD LABOR MANHOURS
WAGE RATES AND PRODUCTIVITY
FIELD LABOR COST
INSTALLATION COST
DIRECT COST
INDIRECT COST
CONTRACTOR'S FEE
BARE PLANT COST
CONTINGENCIES
TOTAL FACILITY COST

Detailed Estimating Procedure
Figure 1

cost is estimated as a function of the field labor activities. Collectively, the direct and indirect costs describe the bare plant cost. In addition, a negotiable contractor's fee must be determined. The contractor's fee is usually based upon job size, status of the national economy, status of the contractor's shop, and negotiations with the client, operating company, or municipality.

Contingencies are applied to the bare plant cost and an associated contractor's fee determined or negotiated.

Contingencies for the definitive estimate are usually quite low since all the major equipment items are defined.

The definitive estimating method is probably the most accurate method but still has its limitations. Site conditions may vary considerably during construction of the environmental protection facility and labor productivity may drastically change during the actual construction phase. Definitive estimating is also very expensive and time consuming. As a result, the definitive estimate is usually prepared once and then only for those projects that have had a prior go-ahead from management.

Because of the limitations inherent in definitive estimating techniques, conceptual estimates are used to determine a reasonable estimate of the costs for a facility and for the rapid evaluation of alternative processing schemes and site selections. The techniques available for preparing conceptual estimates fall into three basic categories: approximate or factored estimates, personal experience, and computer-aided techniques.

In the factored estimating method, equipment item costs are developed, factors for installing the equipment determined, and selection of "appropriate" factors for the indirect costs (prime contractor engineering and construction overhead costs) are chosen.

Equipment costs for the factored estimating method can be obtained from various sources. The process engineer may obtain quotations from equipment vendors, utilize cost versus capacity charts, or use recent data from his own personal files.

In selecting factors to install the equipment for the protection facility, the process engineer can only "estimate" the effects of the economy of scale (e.g. reuse factors on forms for concrete, overpour quantities for clarifiers and thickeners), and the other cost engineering relationships which are, in many cases, complex functions. After selecting factors for the installation accounts (equipment setting and handling, piping, concrete, steel, instrumentation, electrical, insulation, and paint) he applies these factors separately to the equipment cost to obtain field material and labor costs.

Factors are also selected to obtain prime contractor engineering and construction overhead costs and are added to the direct plant cost to obtain the bare plant costs. A contractor's fee is applied to the sum of the bare plant cost plus contingencies and we arrive at a preliminary factored estimated cost for the proposed facility is obtained.

Another method used in conceptual estimates relies upon the experience of the individual engineer preparing the estimate. This method is known as the rule of thumb method. It usually relies upon experience in a specific area of pollution control technology cumulating in the correlation of cost engineering data so as to develop cost versus capacity curves for a particular type of environmental protection facility.

The third technique which is available is the use of computer-aided estimating systems. The CØ$T® (Cost Oriented Systems Technique) System, used for the development of data in this Manual,is such a system. It is a computer-aided cost engineering/cost estimating system which utilizes a contractor's type of cost structure to estimate and assemble all calculated costs.

The contractor arrives at the selling price (fixed capital cost of the environmental protection facility) by determining equipment costs, direct costs, subcontract costs, field labor costs, construction overhead costs, engineering costs, contingencies, his own home office costs, and by negotiating a contractor's fee with the client, operating company or municipality. The C0$T® System utilizes a computerized cost estimating structure which simulates this method by assembling the computer-aided estimate in a sequential and logical order. The flow of major cost elements and the associated calculations in this cost structure is shown in Figure 2. Detailed discussion of this structure is deferred to Section V, SOURCE AND NATURE OF COST MANUAL DATA.

The primary goal in the preparation of a conceptual estimate of a proposed environmental protection process is the analysis of cost engineering data so as to obtain a reasonable estimate of the proposed facility cost. The computer-aided cost engineering system C0$T®, which simulates all the design and construction activities, provides a more reliable and consistent method of estimation than existing manual conceptual techniques. The cost engineering data presented in the Data Manual has been developed using the C0$T® System so as to provide its advantages in a manual technique. The cost-parameter graphs and tables are thus not fitted point data relationships or empirical rules of thumb but are the results obtained by utilizing the System to estimate the installed costs for the reported equipment modules and conditions.

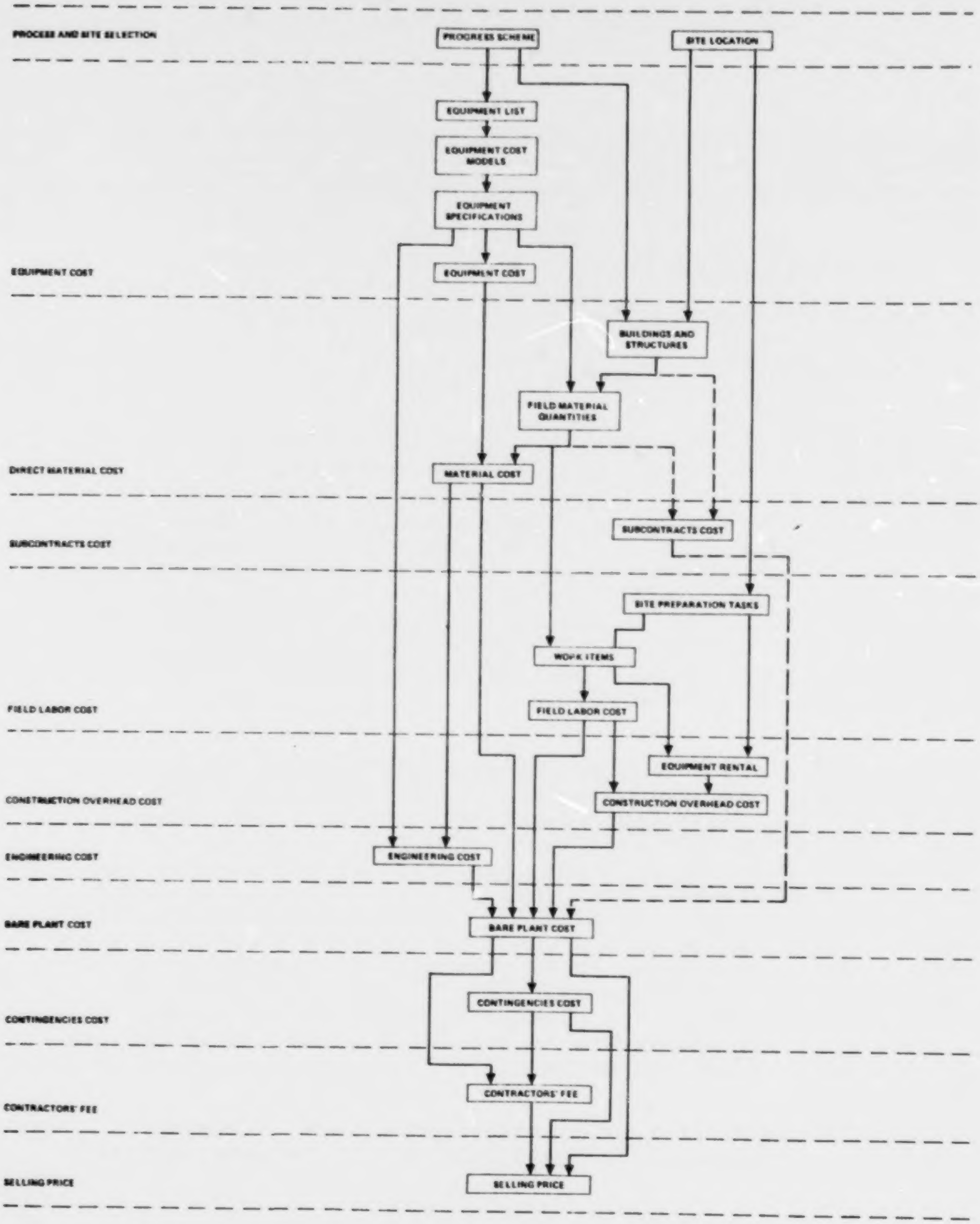

PROCESS AND SITE SELECTION
PROGRESS SCHEME
SITE LOCATION
EQUIPMENT LIST
EQUIPMENT COST MODELS
EQUIPMENT SPECIFICATIONS
EQUIPMENT COST
EQUIPMENT COST
BUILDINGS AND STRUCTURES
FIELD MATERIAL QUANTITIES
DIRECT MATERIAL COST
MATERIAL COST
SUBCONTRACTS COST
SUBCONTRACTS COST
SITE PREPARATION TASKS
WORK ITEMS
FIELD LABOR COST
FIELD LABOR COST
EQUIPMENT RENTAL
CONSTRUCTION OVERHEAD COST
CONSTRUCTION OVERHEAD COST
ENGINEERING COST
ENGINEERING COST
BARE PLANT COST
BARE PLANT COST
CONTINGENCIES COST
CONTINGENCIES COST
CONTRACTORS' FEE
CONTRACTORS' FEE
SELLING PRICE
SELLING PRICE

Figure 2

CØ$T® System Cost Structure

SECTION IV

POLLUTION CONTROL ECONOMICS

For purposes of discussion, and in keeping with the objectives of this User Guide, it is convenient to divide environmental protection economics into three sub-categories:

1. Installed Process Cost,
2. Annual Process Cost, and
3. Profitability

As implied by the designation, installed process cost represents the sum total of all expenses encountered in obtaining a physically installed process. In addition to the cost of the individual items of installed equipment, additional costs for design, construction, site development, etc. must be recognized as part of the installed process cost. Below in the next portion of this Section, each element of the installed process cost will be discussed and the principal features of the methodology for estimating installed process cost, using installed equipment module costs as a basis, will be presented.

Environmental protection processes costs cannot, however, be reasonably compared using only installed costs. Two processes with equivalent installed costs may, for example, have different useful lifetimes, operating personnel requirements, maintenance costs, tax credits, utility and raw material requirements, etc. All of these factors influence the net cost of the processes. A correct basis of comparison requires examination of the costs incurred on a per unit time basis. For convenience, it is customary to examine these costs on a per year basis and refer to the net cost as the annual process cost. The various elements of the annual process cost are considered in detail in a subsequent portion of this Section and the methodology for their estimation is discussed.

Frequently, comparison of alternate processes, assuming equivalent technological, legal, and social factors, can be made on the basis of annual process cost. There are, however, cases in which the economic comparison must be extended to include an analysis of potential profitability.

If marketable products and/or by products are produced, the net income from sales may be sufficient to significantly reduce the net cost of the process or even result in a profit for its operation. In either case, the elements which comprise profit would be evaluated and the optimum selected so as to minimize overall loss or to maximize profit.

It is also important to note that environmental protection processes are frequently a portion of a larger processing system. As technology and process integration of protection techniques advance, it will also be more difficult to isolate protection processes as being unique sub-systems. Thus the objective of design and operation will increasingly be addressed at the overall processing system level rather than at the sub-system level. In only relatively few cases does optimization at the overall level exclude profit.

In the last portion of this Section, the elements comprising the evaluation of profit are examined and the common criteria for comparing the potential profitability of alternative processes are discussed.

INSTALLED PROCESS COST

Installed process cost, also frequently referred to as total capital investment or total fixed capital cost with occassional variation in exact definitions, consists of four major categories of costs:

1. Direct costs,
2. Indirect costs,
3. Contractor's fee, and
4. Contingencies

The term direct costs refers to the cost of the material and labor required for the plant and consists of:

1. Purchased equipment costs,
2. Direct field cost (the cost of installing purchased equipment), including:
    - a. equipment handling, setting, and field erection,
    - b. piping,
    - c. concrete,
    - d. steel,
    - e. instrumentation,
    - f. electrical,
    - g. insulation, and
    - h. paint,
3. Cost of buildings, structures, and offsite facilities,
4. Cost of yard improvements,
5. Service facilities and auxiliary facilities,
6. Land costs, and
7. Subcontracts as required.

Indirect costs, in turn, are composed of:

1. Engineering and supervision costs, and
2. Construction overhead

The total installed plant cost is then the sum of the direct and indirect costs, the contractor's fee, and the amount allocated for contingencies.

(As applicable, start-up expenses, interest on capital during construction, and working capital for inventories, accounts payable, required cash on hand, etc. must also be considered in establishing the total process cost. They are at variance, however, with the usual connotations implied by the term installed process cost.)

To provide an order of magnitude comparison of these costs, direct costs usually are 70-85% of the total and purchased equipment costs usually range from 15-25% of the total.

The term bare plant cost may be used to reflect all elements of the installed process cost enumerated above with the exception of the contractor's fee, contingencies, and land. The contractor's fee and contingencies are customarily negotiable items and the cost of land can vary considerably from installation to installation. Consequently, the bare plant cost reflects the absence of major negotiable items and the variable cost of land. The cost information presented in the accompanying Data Manual adopts a bare installed equipment module cost orientation which reflects the contribution to the bare plant cost of the equipment item represented by the installed equipment module. Thus all direct and indirect charges for an item of equipment, except land and other than "norm" equipment applications are included in the 1972 costs given for the individual installed equipment modules.

Total installed process cost may be estimated by summing costs (after escalation if necessary) of the individual installed equipment modules contained in the process, the cost of items not included as modules such as buildings, yard improvements, and service facilities, the cost of subcontracted elements, the cost of land, and the costs of the contractor's fee and contingencies. Further details of this procedure is found in Section IX: ESTIMATION OF INSTALLED PROCESS COST.

Cost escalation is frequently one of the most difficult and uncertain aspects of cost estimating. To aid the user in evaluating this crucial element, the basic principles available for cost escalation are discussed in Section VII.

Escalating the given cost data into the future can be accomplished by using a cost index. The use of the Marshall & Stevens Equipment Cost Index and the Engineering News Record Construction Cost Index to escalate costs is discussed in detail.

ANNUAL PROCESS COST

The annual cost of an environmental protection process is composed of three major categories of costs. These categories are:

1. Fixed charges,
2. Direct operating costs, and
3. Indirect operating costs.

Fixed charges represent those elements of annual cost which do not vary significantly from year to year and which are relatively independent of the process operating rate. As such, fixed charges generally include:

1. The amortization of the depreciable capital investment,
2. The interest on nondepreciable capital investment,
3. Rent,
4. Insurance and property taxes, and
5. The amortization of lump sum royalties, licenses, and fees.

Direct operating costs include those elements which are directly connected with process operation. Included in this category are:

1. Raw material costs,
2. Utility costs (steam, electricity, fuel, water, refrigeration),
3. Operating labor cost,
4. Maintenance supplies, materials, and labor costs,
5. Royalties or fees directly related to the process operating

or the production rate,

6. Contractual services, and
7. Residual waste disposal.

Indirect operating costs include the necessary supportive administrative, staff, and service expenses. In this category are:

1. Plant overhead costs (safety service, general plant maintenance, general engineering, payroll overhead, general plant overhead, etc.),
2. Administrative expenses (executive salaries, clerical wages, office supplies and equipment, etc.),
3. If applicable, distribution and marketing costs, and
4. If applicable, research and development costs.

When analyzing annual process cost, it is essential to first establish the degree of detail desired and indeed possible. For an operating plant, each category can be further subdivided into a detailed item by item listing in accordance with the accounting procedures established by the organization. For preliminary cost estimating where information is frequently at a minimum, one is frequently forced to quantify only the major elements and reasonably estimate that which may be additionally required to have a successful operation. It is useful to note that elements which are common to process alternatives being compared need not be considered if comparisons and conclusions are to be made on the basis of annual cost alone. These common elements would simply add the same incremental amount to the annual cost of each alternative.

The major constituent of the fixed charges for a process is generally the amortization of the depreciable capital investment. Depreciable capital investment is that amount of the installed process worth which, because of wear and tear or obsolescence, realizes a decrease in its net worth with time. Land and working capital, which are considered recoverable, are thus specifically excluded. Likewise, if the facility will have a salvage value at the end of its useful lifetime, this amount of the investment is recoverable and thus is not depreciable. Expressed in equation form:

$$DC = IPC - L - SV - W \qquad 1)$$

where

DC = depreciable capital investment

IPC = installed process cost including working capital

L = land cost

SV = salvage value of process at the end of its useful lifetime

W = working capital

The annual fixed charge for depreciable capital investment is computed by establishing the annual amount of money which must be placed in a fund, having an available annual interest rate of i, to yield, at the end of the useful lifetime of the process, an amount in the fund equal to the depreciable capital investment.

The fund so established is called the sinking fund and the fraction of the original investment which must annually be put in the fund is called the sinking fund factor.

Mathematically, it may be verified that

$$SFF = \frac{i}{(1+i)^L - 1} \qquad 2)$$

where

SFF = sinking fund factor, yearly basis

i = annual interest rate earned in sinking fund

L = useful lifetime of process, years

For the convenience of the user, tabular values of SFF for a range of values of i and L are presented in Appendix B.

In the case of a bond issue for the initial investment, interest on the bond issue must also be recognized as an expense and can conveniently be considered part of the annual fixed charges on depreciable capital investment. Including this charge,

$$FC_{DC} = SFF\,(DC) + i_B\,(B_{DC}) \qquad 3)$$

where

FC_{DC} = annual fixed charges on depreciable capital investment

SFF = sinking fund factor

DC = depreciable capital investment

i_B = interest rate for bond

B_{DC} = amount of bond issue for depreciable capital investment

In most cases, a common useful lifetime is established for all equipment in the process and referred to as the useful process lifetime. In special cases, such as having a process composed of two sub-processes, individual lifetimes may be established for each. Thus if a power generation station of general utility was completed simultaneously with a highly specialized process of limited lifetime, the power station would be amortized over a longer period of time than the specialized process.

Nondepreciable capital investment includes the cost of land, the working capital, and the salvage value. Capital for these items would frequently be included in a bond issue and thus a fixed charge for interest on the portion of the bond for nondepreciable capital investment would have to be included. Land costs and working capital are theoretically recoverable at any time, are not depreciable, and thus do not have corresponding fixed charges. Salvage value represents a credit (i.e. a negative fixed charge) which is obtainable at the end of the useful lifetime. It may thus be included as a negative fixed charge after annual amortization using the sinking fund factor. In summary:

$$FC_{NC} = i_B (B_{NC}) - SFF (SV) \qquad 4)$$

where

FC_{NC} = annual fixed charges on nondepreciable capital investment

i_B = annual interest rate for bond

B_{NC} = amount of bond issue for nondepreciable capital investment

SFF = sinking fund factor

SV = salvage value

The annual fixed charge for rent, FC_R, must be determined on a process by process basis because of its potential variability.

Annual fixed charges for insurance and property taxes are determined from the annual rate established times the amount of investment applicable.

Thus

$$FC_I = r_I \ I_I \quad \text{and} \quad FC_{PT} = r_{PT} \ I_{PT} \qquad 5)$$

where

FC_I = annual fixed charge for insurance

r_I = annual insurance rate

I_I = investment on which insurance is applicable

FC_{PT} = annual fixed charges for property taxes

r_{PT} = annual rate for property taxes

I_{PT} = investment on which property tax is applicable

Knowledge of local regulations and rates is required before FC_I and FC_{PT} can be evaluated.

The annual fixed charge for lump sum royalties , licenses, and fees, as these items are appropriate, is obtained by amortization using the sinking fund factor. Thus

$$FC_L = SFF\ (C_L) \qquad 6)$$

where

FC_L = annual fixed charge for lump sum royalties, licenses, and fees

SFF = sinking fund factor

C_L = amount of lump sum royalties, licenses, and fees acquired at beginning of project

The total annual fixed charge is the sum of the component parts:

$$FC = FC_{DC} + FC_{NC} + FC_R + FC_I + FC_{PT} + FC_L \qquad 7)$$

where

FC = total annual fixed charge
and the annual fixed charge
FC_{DC} is on depreciable capital
FC_{NC} is on nondepreciable capital,
FC_R is for rent,
FC_I is for insurance,
FC_{PT} is for property taxes, and
FC_L is for lump sum royalties, licenses, and fees.

Direct operating costs are very process dependent and thus are best estimated by:

1. Detailing the annual quantity required for each element of the direct operating cost,
2. Establishing the per unit rate for each element,
3. Computing the annual cost of each element as the product of the quantity and rate, and
4. Summing over all elements to obtain the total.

Elements such as raw materials, residual waste disposal, utilities, royalties, fees, or contractual services, can not be generalized on the basis of an equipment list only. These must therefore be determined on a process by process basis.

Average operating labor and maintenance requirements may, however, be estimated on the basis of an equipment item list. For the convenience of the user, the average requirements for each installed equipment module included in the accompanying Data Manual have been examined and have been included as a part of the data for each.

Indirect operating costs are industry, location, and process dependent and are best handled by developing a check list of the varied elements involved and subsequently estimating each on a process by process basis.

In addition to the annual process costs discussed above, other cost and credit elements must be considered if annual profit, directly or indirectly, is to be considered.

Frequently, of particular importance in the construction (or addition) of environmental protection facilities by a profit making concern is the income tax credit. This element reflects the reduction in taxable income realized by the depreciation of the environmental protection facility. Viewed in an alternative way, the tax credit can also be considered as an element for partial compensation of the annual process cost, thereby reducing the net cost of the environmental protection facility to a profit making concern.

The rules for determining tax credit are administered by the Internal Revenue Service and in any particular instance may become detailed and involved. As a result, the discussion here will be limited to basic principals which can be used to estimate the tax credit.

The value of the annual tax credit may be estimated using:

$$TC = d\,t\,(DC) \qquad 8)$$

where

TC = annual tax credit

d = annual depreciation rate

DC = depreciable capital investment

t = income tax rate

One of four methods is generally used to determine the annual depreciation rate consistent with the provisions of the Internal Revenue Code. These methods are:

1. Straight line depreciation,
2. Double declining depreciation,
3. Sum-of-digits depreciation, and
4. Double declining switching to straight line depreciation.

For straight line depreciation, a constant percentage is taken over the entire lifetime of the facility:

$$d_{SL} = \frac{100}{L_T} \ \%/\text{yr.} \qquad 9)$$

where

d_{SL} = annual straight line depreciation percentage

L_T = lifetime of facility for tax purposes in years

Total depreciation is thus achieved with the straight line method.

In the double declining method, the depreciation rate is twice the straight line rate as applied to each year's remaining undepreciated investment. It thus varies from year to year. Mathematically,

$$d_{DD} = \left(1-\frac{2}{L_T}\right)^{y-1} \left(\frac{200}{L_T}\right) \%/\text{yr.} \qquad 10)$$

where

d_{DD} = annual double declining depreciation percentage

L_T = lifetime of facility for tax purposes in years

y = year ranging from 1, ..., L_T.

Although higher than the straight line percentage initially, total depreciation does not occur in the double declining method.

The sum-of-digits method specifies the depreciation rate to be the ratio of the useful remaining life at the beginning of the year divided by the sum of the integers 1, ..., L_T. It consequently varies with time and may be expressed mathematically as:

$$d_{SD} = \frac{200\ (L_T - y+1)}{L_T\ (L_T + 1)}\ \%/\ \text{yr.} \qquad 11)$$

where

d_{SD} = annual sum-of-digits depreciation percentage

L_T = lifetime of facility for tax purposes in years

y = year ranging from 1, ..., L_T.

For double declining switching to straight line, the initial high percentage of double declining is coupled with the total depreciation of straight line to yield a composite rule. The maximum tax credit using this method, accounting for the time value of money, is obtained by switching to straight line at the year which is the next larger integer value than $(\frac{L_T}{2} + 1)$.

Letting M represents this number:

$$d_C = \begin{cases} \dfrac{200\,(L_T - y + 1)}{L_T\,(L_T + 1)} & \%/\text{yr for } 1 \leq y < M \\[2ex] \dfrac{100\,(1 - \frac{2}{L_T})}{L_T - M - 1}^{\,y-1} & \%/\text{yr for } M \leq y \leq L_T \end{cases} \qquad 12)$$

where

d_C = annual composite depreciation percentage

M = first year of straight line usage

L_T = lifetime of facility for tax purposes in years

y = year ranging from 1, ..., L_T

Alternate procedures, shorter lifetimes for tax purposes, or even additional tax credit could possibly be considerations for enhancing environmental protection. Speculation on these possibilities is left to the user.

For the convenience of the user, depreciation schedules indicating the percentage per year as well as the cumulative percentage indicating the percentage depreciated to that time are presented in Appendix C.

In Section VIII: ESTIMATION OF THE ANNUAL COST OF A SINGLE EQUIPMENT MODULE, further detail together with a suggested worksheet are presented for estimating the elements of the annual cost and tax credit of a single installed equipment module. Section X : ESTIMATION OF ANNUAL PROCESS COST considers the estimating procedure for a process. In both instances, the relevancy of the accompanying Data Manual is explicitly considered.

PROCESS PROFITABILITY

Many of the elements which enter into the estimation of profit have been discussed above. Below, those additional elements which must be considered are discussed and all required elements are collected into an estimate of profit.

Process income is realized by the sale of marketable products each having a projected volume per year and an average per volume price. The annual gross profit or return may be defined as the annual amount of sales less all the elements of the annual process cost with the exception of the salvage value credit and the amortization of the capital investment. Annual gross profit is thus the profit before income taxes and depreciation. In equation form:

$$S = \sum u_i \ V_i \ ; \text{ all products } i \qquad 13)$$

where

S = annual sales

u_i = per volume price of product i

V_i = annual volume of sales for product i

and

$$G = S - \left(i_B \, (B) + FC_R + FC_I + FC_{PT} + DOC + IOC \right) \qquad 14)$$

where

G = annual gross return or profit, before income taxes and depreciation

S = annual sales

i_B = annual interest rate on bond

B = amount of bond

FC_R = annual fixed charge for rent

FC_I = annual fixed charge for insurance

FC_{PT} = annual fixed charge for property taxes

DOC = annual direct operating costs

IOC = annual indirect operating costs

Annual net profit is obtained by applying income taxes and depreciation to the annual gross return. Thus, neglecting the complexity and intricacies of the income tax laws and of detailed depreciation accounting.

$$P = G - d_a (DC) - FC_L - t (G - d_T (DC)) \qquad 15)$$

where

P = annual net profit

G = annual gross profit

d_a = annual depreciation rates used for accounting purposes (i.e. sinking fund factor)

DC = depreciable capital investment

FC_L = amortization of one time royalties, fees, etc.

t = net average of the annual income tax rate

d_T = annual depreciation rate used for tax purposes

$d_T t(DC)$ = annual tax credit

As previously indicated d_a, the annual depreciation rate used for accounting purposes, may be evaluated using the sinking fund factor and d_T, the annual depreciation rate for tax purposes, is generally chosen as being either straight line, double declining, the sum of digits, or a composite approved by the Internal Revenue Code. If salvage value can be expected to be appreciable, an annual credit for it could also be placed in the evaluation of the net profit.

A number of methods are used to evaluate the profit position of a processing system.

The annual rate of return is computed by dividing the annual profit by the amount of the investment. Basing the return on the net profit and the installed process cost including working capital

$$R = 100\ P/IPC \qquad 16)$$

where

R = annual rate of return, as a percentage

P = annual net profit

IPC = installed process cost (include working capital if not already included)

Alternately, the rate of return before taxes, the rate of return based on the average annual undepreciated income, etc. might be used for the evaluation of a profit position.

Another index used is the payout time, generally defined as being the ratio of the installed plant cost divided by the annual sales.

$$t_p = IPC/S \qquad 17)$$

where

t_p = payout time in years

IPC = installed plant cost (generally working capital is excluded)

S = annual sales

In contrast to the rate of return for which the higher the percentage the more attractive the investment is, a lower value of the payout time is more attractive than a higher value.

Payout time may alternatively be based on profit rather than sales or on the average undepreciated investment rather than the installed process cost.

An index known as the venture profit has also found use in industry. The annual venture profit is obtained by subtracting from the annual net profit a minimum acceptable return on the required investment. Expressed in equation form:

$$V = P - i_m \text{ (IPC)} \qquad 18)$$

where

V = annual venture worth

P = annual net profit

i_m = minimum acceptable rate of return

IPC = installed process cost (including the working capital)

The larger the venture profit, the more attractive the project would be. A venture profit of zero would be a lower acceptable bound and would indicate that the profit is just sufficient to meet the minimum acceptable rate of return. Using the venture profit, two projects having different factors of risk could be compared by assigning a higher minimum acceptable rate of return to the one of higher risk.

Regardless of the annual profit index chosen, comparison of potential alternatives may still be difficult because sales, operating costs, depreciation, taxes, etc., and hence profit, may change from year to year. What is required for comparison in such cases is an expression for the total profit obtainable over the entire project lifetime for each alternative.

At first glance, it would appear that the simple arithmetic sum of annual profits would suffice. In reality such is not necessarily the case because of the time value of money. As an example, $100 now invested at 6% interest for one year will be worth $106 one year from now, $112.36 two years from now, etc., if compounded each year; or stating the equivalent but in an alternate way, if money can be invested at 6% compound interest per year, a profit of $100 now is equivalent to a profit of $106 one year from now, to a profit of $112.36 two years from now, etc. Thus, in order to be able to compare monies at different times, it is first necessary to bring them all to the equivalent amounts at one given time.

For profit, the most convenient time at which to evaluate profits spread over a period of years is the time of project initiation, commonly referred to as the present for convenience.

If money is worth 100 i % per year, the venture profit at the end of year one, V_1, has a present value of $V_1/(1+i)$; the venture profit at the end of year two, V_2, has a present value of $V_2/(1+i)^2$; etc. Or, in general, defining the venture worth as the present value of all venture projects over the lifetime of the project:

$$W = \frac{V_i}{(1+i)} + \frac{V_2}{(1+i)^2} + \cdots + \frac{V_L}{(1+i)^L} = \sum_{k=1}^{L} \frac{V_k}{(1+i)^k} \qquad 19)$$

where

W = venture worth or the present value of all venture profits over the lifetime of the project

V_k = venture profit at the end of year k realized by operations during year k

i = interest rate earned on money

L = lifetime of project in years

Substituting in the definition of the venture profit, relating it back to the gross profit, using the sinking fund factor for the depreciation of depreciable capital for accounting purposes, and algebraically manipulating the equation for the venture worth, it may be verified that

$$W = \sum_{k=1}^{L} \frac{(1-t)G_k}{(1+i)^k} + \sum_{k=1}^{L} \frac{d_{t,k}t(DC)}{(1+i)^k} \qquad 20)$$

$$- \left[\frac{(1+i)^L - 1}{i\,(1+i)^L} \right] (i_m - i)\,(DC + WC)$$

$$- \quad DC$$

$$- \left[\frac{(1+i)^L - 1}{(1+i)^L} \right] (WC) + \left[\frac{(1-t)}{(1+i)^L} \right] (SV)$$

where

W = venture worth

L = project lifetime in years

t = income tax rate

i = interest rate earned on money

G_k = gross profit for year k

$d_{t,k}$ = annual depreciation rate for tax purposes for year k

DC = depreciable capital investment

i_m = minimum acceptable rate of return

WC = working capital

SV = salvage value

In equation 20, significance can be given to each term comprising the venture worth.

1. The first term represents the present value of the portion of the gross income which is not taxed.
2. The second term represents the present value of the tax credit after it has been applied at the given income tax rate and to the amount of depreciable capital investment.
3. The third term represents the present value of the return on investment over and above the acceptable rate of return.
4. The fourth term represents the present value of all the contributions made to the sinking fund. By the definition of the sinking fund, this is the amount of the depreciable capital investment.
5. The fifth term is the present value of the working capital, and
6. The sixth term is the present value of the salvage value.

Although developed assuming potential sales and thus potential profit, venture worth may be applied if such is not the case. It will, of course, be negative but the less negative it is, the less the total project cost will be over its lifetime. To illustrate the simplifications which may be incorporated, assume:

1. Sales are zero so that

   $$G_k = -FC_k - DOC_k - IOC_k,$$

2. The minimum acceptable rate of return is the available interest rate, and
3. Salvage value is negligible.

Under these assumptions which are reasonable for a non-profit environmental protection facility placed in a profit making concern:

$$W = -\sum_{k=1}^{L} \frac{(1-t)\,(FC_k + DOC_k + IOC_k)}{(1+i)^k} + \sum_{k=1}^{L} \frac{d_{t,k}\; t\;(DC)}{(1+i)^k} - DC - \left[\frac{(1+i)^L - 1}{(1+i)^L}\right](WC) \qquad 21)$$

where

W = venture worth

L = project lifetime in years

t = income tax rate

i = available interest rate

FC_k = fixed charges for year k

DOC_k = direct operating cost for year k

IOC_k = indirect operating cost for year k

DC = depreciable capital investment

$d_{t,k}$ = annual depreciation rate for tax purposes in year k

WC = working capital

In equation 21,

1. The first term on the right represents the present value of the net charge for annual operating costs ,
2. The second term represents the net tax credit as applied at the given tax rate and to the amount of depreciable capital investment required ,
3. The third term is the charge for the depreciable capital investment, and
4. The fourth term is the present value of the charge for working capital .

Of these terms, only the second poses a great problem in evaluation. In particular, straight line, double declining, sum-of-digits, or double declining switching to straight line depreciation may be used and only for straight line is the rate constant each year. For the convenience of the user, this difficulty has been circumvented by preparing extensive tables of:

$$\sum_{k=1}^{L} \frac{d_{t,k}}{(1+i)^k}$$, referred to as the discounted tax credit rate,

for a wide range of interest rates and depreciable lifetimes. These values may be found in Appendix D.

One further computational aid is offerred for the case in which the annual operating costs do not vary with time. In this case,

$$- \sum_{k=1}^{L} \frac{(1-t)(FC_k + DOC_k + IOC_k)}{(1+i)^k} \qquad 22)$$

$$= - (1-t)\ (FC + DOC + IOC) \left[\frac{(1+i)^L - 1}{i\ (1+i)^L} \right]$$

where

t = income tax rate

i = available interest rate

L = depreciable lifetime in years

FC = annual fixed charges, assumed constant over lifetime

DOC = annual direct operating cost, assumed constant over lifetime

IOC = annual indirect operating cost, assumed constant over lifetime

SECTION V

SOURCE AND NATURE OF COST MANUAL DATA

SUMMARY OF COMPUTERIZED COST SIMULATION METHODOLOGY

The data presented in the ENVIRONMENTAL PROTECTION COST MANUAL has been prepared using a computer-aided, detailed estimating system. This system, CØ$T® (Cost Oriented Systems Technique), utilizes a detailed cost engineering/computer programming technique known as "computerized cost simulation". Cost simulation is essentially a method by which the costs for a proposed facility are simulated by a stepwise procedure which includes:

1. A detailed design of each equipment item including a complete mechanical design according to the appropriate code or standard (e.g. American Society of Mechanical Engineers (ASME) Code for vessels, Tubular Equipment Manufacturers Association (TEMA) for heat exchangers, etc.),
2. A simulation of the equipment item vendor's costing procedure using vendor's cost structures,
3. A bulk (field) material quantity takeoff based upon equipment item weights, base area, height, material of construction, type, etc.,
4. A determination of the field labor manhours necessary to install the bulk material quantities by work items which relate field labor manhours by craft and crews to material quantities and labor activities, and
5. A determination of the associated indirect costs for the prime contractor's engineering and construction overhead.

Computerized cost simulation (or detailed estimating) is not used by all computer-aided cost estimating systems. A short review of other types of systems will place computerized cost simulation in its proper perspective.

COMPUTER-AIDED ESTIMATING TECHNIQUES

Computer-aided estimating systems can be generally divided into three basic categories:

1. addition systems,
2. factored systems and,
3. detailed estimating systems.

The addition type system can be described as a big adding machine. The computer is only used to correctly add up all the user's supplied cost values (wage rates, material quantities, material unit costs, equipment costs, etc.). The addition system usually produces various summary reports by account codes and is used as a cost control tool by the different departments in a company if and when the project is given the "go sign" from management.

Addition type systems perform no data manipulation, cost engineering logic, or cost analysis on the input data.

Factored estimating systems were developed as an answer to supply some of the cost analysis required in the preparation of estimates. This cost analysis usually takes the form of an analysis of the equipment item types, equipment mix, ranges of equipment classification costs, operating conditions (e.g. temperature, pressure), to arrive at suitable factors for the bulk material and labor costs. User required input varies considerably for factored systems ranging from the user being requested to supply all of the inputs necessary for the system as in the addition system to information concerning the equipment items such as equipment type, estimated costs, size, etc. In the latter case the factored system relies upon its factored analysis capability to develop the bulk quantities based upon the user's supplied values, costs, and other quantities concerning the equipment items.

Factored systems are limited in their application to new and novel processes since they can only apply cost engineering analysis in a predetermined manner.

The detailed estimating system differs considerably from both the addition and factored type systems. The detailed system requires of the user less "definitive" type information concerning the equipment items than either the addition or factored systems. Instead of relying upon "pre-determined" factors, the detailed system determines the cost of the equipment items by civil and mechanical design algorithms for each equipment item. This simulates the analogous operations at the contractor's design and drafting department and the vendor's design shop.

The detailed system costs the equipment item the same way the vendor does (buying material, applying fabrication labor to material relationships to assemble the subassemblies, etc.), and determines the bulk material quantities by a computer generated material quantity takeoff. After obtaining all direct field costs, indirect costs are calculated by appropriate costing models representing current practices in contractor's shops.

The detailed system is based upon minimum user input. In fact, it is designed to operate with less input than that required for the addition or factored type systems.

The detailed estimating system can be programmed to automatically inter-relate cost engineering relationships in order to "build-up" such a relationship if required for an unusual or atypical condition encountered in generating the estimate. The detailed system does this without pre-determination on the part of the user.

C0ST® SYSTEM COST STRUCTURE

The C0ST® System relies upon a cost structure which allows the computer to simulate the contractor's design and costing procedures. This is a very important point because it is the contractor's cost which must be paid for the pollution control facility. Therefore if one is estimating what the contractor's cost is going to be, it should be done within a contractor's type of cost structure, and not within a cost structure which resembles the cost engineering methodology for process/economic thinking at an operating company. Referring to the Cost Structure Diagram (Figure 2), the CØ$T® System's Cost Structure closely follows the design contractor's work flow procedure. Starting at the top with the process scheme and equipment location being determined by the user of the System, all flow of information is generated primarily from these two decision elements.

EQUIPMENT COST

The CØ$T® System contains many equipment cost models including the most common processing equipment items such as centrifugal pumps, heat exchangers, tray towers, etc., as well as some special industry type items such as screw conveyors, floatation machines, etc.

Each equipment cost model is a series of cost engineering equations which can take user specified data on that equipment item, mechanically (and civil design if required such as in the case of some wastewater treatment facilities) design the item, generate the material quantities required (e.g. number of plates, nozzles, flanges, weld rod, trays etc. for a tray tower), develop the required vendor's fabrication labor by craft (assemblers, welders, foreman, grinder, machinist, lathe operator, etc.), calculate the labor cost, machine burdens as a function of machine tool operating time, shop overhead, office overhead, general and administrative costs, profit, and summarizing all costs to obtain the estimated purchased equipment cost of the equipment item.

To produce all of this output data for each equipment item, the user need input as minimum data only the key equipment item parameters. For example, minimum input necessary for a tray tower is the tower diameter, number of trays, tray type and material. All of these minimum input variables are known, even at the early stage of process design. The tray tower diameter will be based upon a process consideration of throughput, reflux ratio etc., and the number and type of trays will be a function of the separation desired in the tower itself. Material of construction for the trays and the tower shell are also a process decision since they are based upon material compatability with the particular processing fluid involved.

While these inputs obviously are not all the information that is required by the cost model to completely cost out a tray tower, decisions can be made by the costing model to fill in, so to speak, the blank spaces. It does this by the use of a simple design input matrix. Default values for all required values are selected from the input matrix (one matrix for each equipment item type). Some default values for the tray tower would be 15.0 psig design pressure 650°F design temperature (400°F for nonferrous alloys), 24 inch tray spacing, 0.125 inch corrosion allowance for tower shell, etc.

There are many inter-relationships (labor and material) for the cost engineering variables which must be used in any particular cost model. It should be emphasized that these material and labor quantities are not bulk material and labor quantities but are the vendors' labor and material quantities which are eventually reflected in higher ordered costs (i.e.d. vendors' estimated purchased equipment cost, installed equipment item cost).

The equipment cost model is the key to any detailed system since the data necessary for the computerized material quantity take-off is determined by the equipment cost models. For example, in considering the tray tower, values of tower weight, height, diameter, operating conditions of pressure and temperature, tower and tray materials, etc. are required for the computerized bulk material quantity takeoff for equipment setting and handling, piping, concrete, steel, instrumentation, electrical, insulation, and paint.

The bulk material quantity takeoff performed by the computer internally without prior instructions from the user requires as input information equipment item sizes, weights, materials of construction, and operating conditions generated by the equipment cost models for each equipment item.

Each bulk account (equipment setting, piping, concrete, steel, instrumentation, electrical, insulation, and paint) quantity takeoff is determined separately by the computer. In the contractor's shop, setting, piping, concrete, steel, instrumentation, electrical, insulation and paint are usually handled by separate groups within the estimating and design and drafting departments. One of the reasons for this is that the technology involved in the different bulk accounts require different expertise and different cost engineering methodology in the approach to the particular bulk quantity takeoff. In the detailed estimating System the calculation of these bulk quantities are also separated because the methodology involved in each of these is quite different from the others.

For example, the tower foundation and footing will be calculated based upon the tower height, diameter, and weight values calculated by the tray tower cost model in addition to the soil loading, soil type, wind loading and frost line given for the region as user specified data or System as default values.

Instrumentation material (both primary and secondary) on the other hand is determined by the System as a function of the equipment item type (tray tower, packed column, heat exchanger, etc.), material, operating conditions and certain instrumentation related equipment sizes (e.g. number of tray tower trays, number of shells in a heat exchanger bank). Using these instrumentation related equipment sizes, the detailed estimating system can generate a computerized representation of a piping and instrumentation drawing (P&Id's) which it can use as its basis for the instrumentation material quantity takeoff. In determining secondary instrumentation material, the System defaults to a standard 200 foot run from control room panel board to Operational Unit or battery limit center.

The piping material takeoff, which is perhaps the most critical of all the bulk accounts, requires:

- equipment item type and size (diameter, height, skirt height) to determine pipe line lengths and fittings
- equipment item material and operating conditions (pressure and temperature) to determine schedule numbers and flange ratings
- equipment item type (tray tower, pump, heat exchanger) to determine the fittings and valves list

These material quantities are generated as piping data for each individual equipment item.

Structural steel is determined as a function of equipment type, typical building/structure type (housing the equipment, if any), and facility type.

Insulation bulk quantities are functions of each individual equipment type, size, design temperature, associated pipe area, and associated total equipment area (for each equipment item).

Paint material is a function of the area to be covered, application type, height above ground and other associated cost engineering relationships for each equipment item.

The System's detailed development of bulk material quantities based upon dimensions and other characteristics of the individual equipment items and the equipment item mix itself does not solve all the problems in preparing the computer derived detailed estimate. One of the major problems is the determination of field labor. The detailed estimating system utilizes a work item concept to determine field labor manhours by labor activity and craft. Work items are selected by a logic matrix for each field labor activity. The work item is a representation of a series of cost engineering equations which can relate field labor manhours to material quantities for a specific labor activity by relationships developed from returned field labor for such labor activities on recently completed projects. These cost engineering equations usually concern the field labor activities for a specific crew working at a specific production rate. The production rate used by the C0$T® System corresponds to a man working in the U.S. Gulf Coast Area (Region 6) 42 minutes per hour. The System's Gulf Coast is a composite of return field costs from Baton Rouge and Lake Charles, Louisiana, and Corpus Christi and Houston, Texas. The System has built in features allowing adjustments to other regional locations, wage rates, and/or productivities.

Work items are stored for all of the bulk accounts (equipment setting, piping, concrete, steel, instrumentation, electrical, insulation and paint).

Figure 3 describes a work item for field fabricating piping connections. Notice that this work item makes allowances for materials other than carbon steel by a machineability index. The machineability index (MI) and reciprocal machineability index (RMI) are fabrication labor indices developed to relate differences in fabrication labor from a base material (usually carbon steel) to other materials. MI and RMI indices have been developed for the System for welding, handling and machining.

The selection of work items by a logic matrix enables the System to choose the proper work item for each labor activity required. Figure 4 describes the options open to the System in selecting the concrete pouring activity for each individual equipment item foundation. The automatic selection by the System will be based upon the overall quantity of concrete required, number of similar size foundations in the same Operational Unit, and other pertinent data appropriate to the labor activity. We can observe that the overall relationships which are sometimes used in factored systems such as manhours per cubic yard or dollars per cubic yard may be radically off from reality since they can not take into consideration the effect of economy of scale, forms reuse etc., which a detailed computer-aided estimating System can.

ACCOUNT: Piping

WORK ITEM:

Welded pipe connections for pipe under 8 inches nominal diameter.

BY: H. G. Blecker

DATE: May 18, 1971

DESCRIPTION:

Work item includes pipe layout, cutting, welding, and erection.

CREW MIX:	EQUIPMENT:	MATERIAL:
0.5 Foreman 4 Pipewelders 1 Operating Engr	(4) 400-amp electric welding machines	From production rate

PRODUCTION RATE (100% = 42 WORKING MINUTES PER HOUR)

Production per crew is 4 manhours/hour for the following:

Nominal Pipe Diameter (inches)	Base Manhours per Connection (CS pipe)
1/2	1.10
3/4	1.36
1	1.70
1 1/2	2.47
2	2.38
2 1/2	2.88
3	3.50
3 1/2	4.00
4	4.05
5	5.05
6	5.98
8	7.75

Piping Labor Correction for other Materials:

$$\text{Piping Labor} = \left[(0.7 \times \text{Rate}) + \left[\frac{0.3 \times MI_w \ (\text{X Material}) \times \text{Rate}}{MI_w \ (\text{Carbon Steel})} \right] \right] \times Y$$

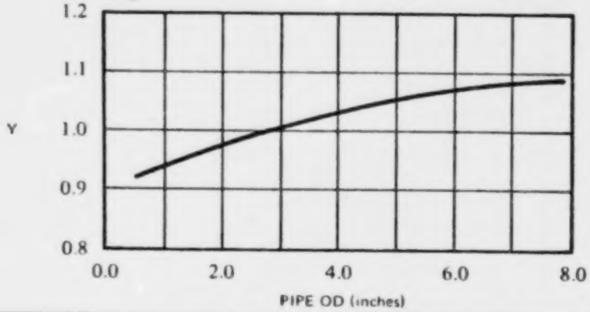


Figure 3

Typical Piping Work Item

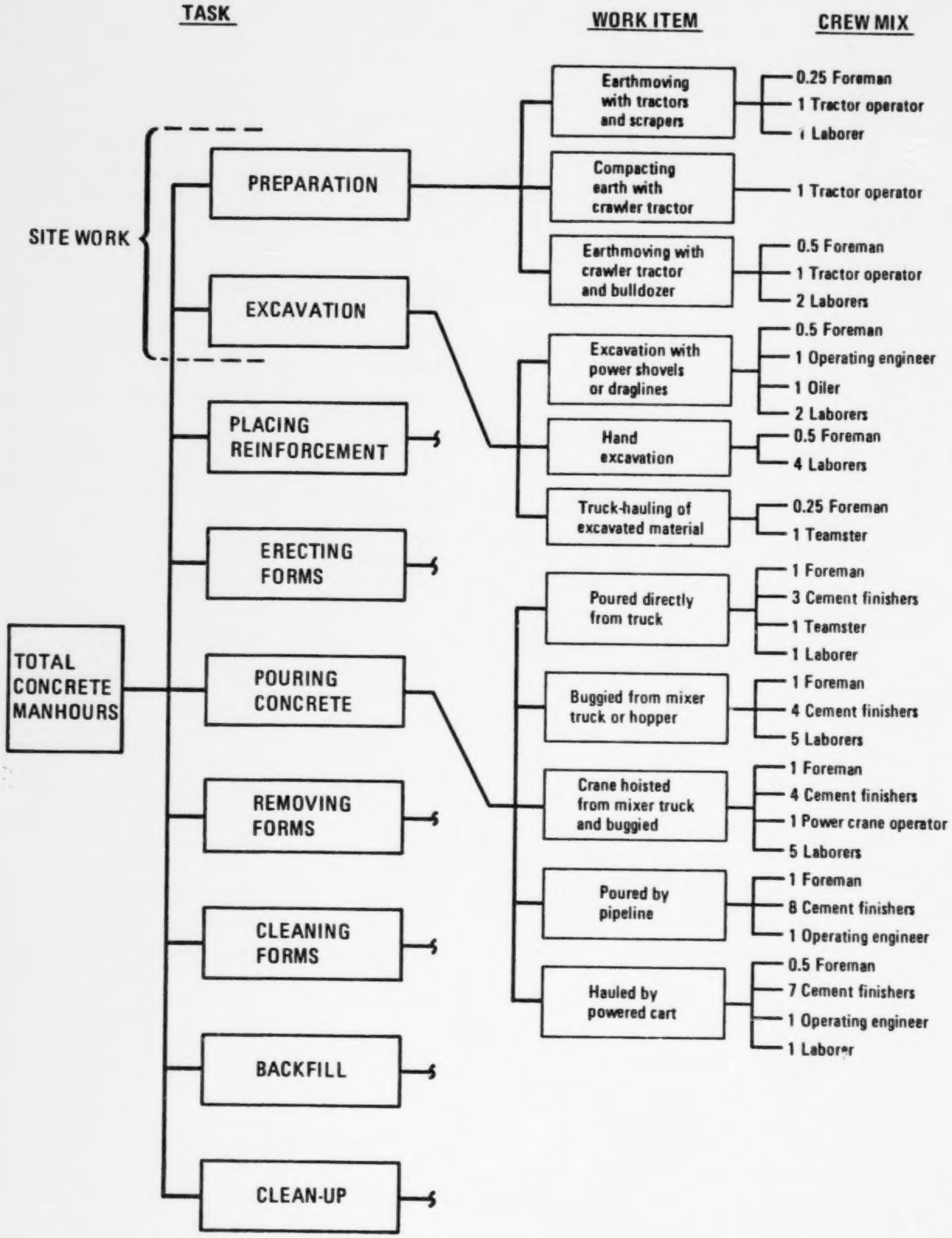

TASK
WORK ITEM
CREW MIX
SITE WORK
TOTAL CONCRETE MANHOURS
PREPARATION
EXCAVATION
PLACING REINFORCEMENT
ERECTING FORMS
POURING CONCRETE
REMOVING FORMS
CLEANING FORMS
BACKFILL
CLEAN-UP
Earthmoving with tractors and scrapers
0.25 Foreman
1 Tractor operator
1 Laborer
Compacting earth with crawler tractor
1 Tractor operator
Earthmoving with crawler tractor and bulldozer
0.5 Foreman
1 Tractor operator
2 Laborers
Excavation with power shovels or draglines
0.5 Foreman
1 Operating engineer
1 Oiler
2 Laborers
Hand excavation
0.5 Foreman
4 Laborers
Truck-hauling of excavated material
0.25 Foreman
1 Teamster
Poured directly from truck
1 Foreman
3 Cement finishers
1 Teamster
1 Laborer
Buggied from mixer truck or hopper
1 Foreman
4 Cement finishers
5 Laborers
Crane hoisted from mixer truck and buggied
1 Foreman
4 Cement finishers
1 Power crane operator
5 Laborers
Poured by pipeline
1 Foreman
8 Cement finishers
1 Operating engineer
Hauled by powered cart
0.5 Foreman
7 Cement finishers
1 Operating engineer
1 Laborer

Figure 4

Concrete Account Labor Activities

Pouring concrete by truck will result in a higher resultant manhour per cubic yard value as opposed to pouring large mass pours by pipeline. On the other hand, the equipment rental account for pouring concrete via pipeline will be incremented by a higher dollar value when compared to pouring concrete by truck.

INDIRECT COST

After the System has determined designs and costs for all equipment items, developed bulk material quantity takeoffs for all equipment items, and developed work crews and field labor manhours for all the direct field labor activities, the indirect costs must be accounted for.

Indirect costs can be divided primarily into two separate groupings, prime contractors engineering and construction overhead.

The prime contractor's engineering manhours consists of project engineering, process engineering, design and drafting, procurement, home office construction, and general services. In addition to these engineering manhour costs, costs for payroll burdens, engineering services and office indirects must be applied to the manhour charges. Each of the manhour charges associated with the engineering portion of the engineering costs are calculated according to the same definitive type estimating procedures used by contractors.

Project engineering is determined as a function of the overall number of equipment items and ottal job size. Design and drafting, however, will be a function of only the non-subcontracted items in the facility. Each of the cost engineering relationships for project engineering, process engineering, design and drafting, procurement, home office construction and general services are all determined separately, based upon different relationships of cost and manhour quantities developed by the System during the direct costing stage.

Construction overhead costs consist of fringe benefits, labor burdens, field supervision, temporary facilities, field services, equipment rental, small tools and miscellaneous insurances, etc. Just as the engineering costs relate primarily to the equipment and direct material portion of the facility costs, the construction overhead costs are calculated primarily as a function of the field labor activities. Each of these (fringe) benefits, labor burdens, etc.) are calculated separately while accounts such as equipment rental which is a construction overhead account is determined cumulatively as the System's estimate is being prepared.

The CØ$T® System determines indirect costs in an analogous manner to the contractor.

METHOD OF DATA PRESENTATION IN DATA MANUAL

The data sheets for the installed equipment item modules in the Data Manual are presented in a structured graphical and tabular format. All the information shown are for installed equipment item modules and were prepared using the CØ$T® System. The installed equipment item modules are presented in alphabetical order.

The first page for each installed equipment item tvpe contains a graphical presentation of the installed base cost for the equipment item in 1972 dollars. The installed base cost includes all appropriate direct costs (equipment setting and handling, piping and ductwork, concrete foundations and footings, structural steel supports and platforms, primary and secondary instrumentation, battery limit electrical items, insulation and paint) and the associated indirect costs (prime contractor engineering [project engineering, process engineering, design and drafting, procurement, home office construction, general services, payroll burdens, engineering services, and office indirects] and construction overhead [fringe benefits, labor burdens, field supervision, temporary facilities, field services, equipment rental, small tools, insurance and miscellaneous costs]).

A schematic representation of the equipment item is shown at the left of the installed base cost plot. This will aid the user in distinquishing between similar equipment items on process flowsheets that he is examining.

Adjustments to the installed base cost where applicable are shown either graphically or in tabular format. These may include regional adjustments which will allow the user to move the installed base cost data to a different regional location, and parametric adjustments of pressure, temperature, flow, width, and other appropriate parameters.

Material adjustments may be shown which will relate the installed base cost to other common materials of construction or fabrication.

Design adjustments may be shown which will relate the installed base cost data to other generic types of items in the same general category as the installed equipment item shown.

Following all the adjustment and base cost data will be a section describing the specific costs included in the installed base cost.

An equation for calculating the installed costs in terms of the installed base cost for 1972 dollars and all appropriate adjustments (regional, parametric, material, design, etc.) will also be shown for each installed equipment item module.

The use of these adjustments to the base cost is discussed in a latter section of this User Guide.

The maintenance cost for a mature year of operation is shown following the equation for determining installed equipment item module cost. These ranges should be carefully analyzed by the user since these are only averages and cover a wide range of operating conditions, industries, corrosivity dependency, cycle times, and maintenance crew efficiencies.

In analyzing the estimated maintenance cost of any facility, this information should be modified to the appropriate portion of the range that the user feels is applicable for the type of industry and management evident for that industry and the industry segment being examined.

Operation costs for each installed equipment item module is given either as a statement mentioning "requires no operator attention" or a range of operator per shift requirements. The statement "requires no operator attention" does not mean that if many of these units are installed in the facility the facility will be totally unmaned. The statement refers to a situation where the operator per shift requirement for this particular installed equipment item module is usually associated with other types of operating equipment more dependent upon operator attention, and as such, when estimating overall operator per shift requirement are not considered in the overall estimate since a sufficient number of operators per shift will be allocated in the more operator loaded equipment item modules.

Three basic factors should be considered when determining the operating cost of any facility. These are the labor rate, operating conditions, and the type of industry. Each of these greatly effects the range of operator per shift requirements.

Labor rates for operators may vary considerable from the Southern U.S. to the northeastern urban corridor.

Operating conditions may vary considerably from facility to facility within the same industry requiring either more or less operator per shifts for the same activity.

The type of industry itself can determine the range in which operator per shift attention will be allocated for a specific installed equipment item module. For example, the food and drug industry may be heavily loaded as far as operator per shift allocation for certain kinds of equipment whereas the mining, petroleum, and heavy chemical processing industries may be very lightly loaded for the same equipment items.

Probable annual depreciation rate and expected equipment lifetime also vary from industry to industry and from equipment item to equipment item in that particular industry.

Following the operation cost section on the data sheets in the Data Manual, a table listing industry group, average depreciation rate, and average expected lifetime will give the user a general range of values to use in estimating depreciation and equipment lifetime.

Supplemental information concerning depreciation rate tables, labor rates, material costs, forst lines and isotachs are shown in other sections of the User Guide and Data Manual. The depreciation rate tables shown in Appendix D in this User Guide will enable the user to more definitively scope a particular project with respect to the allowable depreciation rate that could be expected from the Internal Revenue Service.

The Data Manual contains average field fabrication labor rates for the various EPA regions.

Material costs for unusual kinds of equipment items are given as a general guide in extrapolating the Data Manual costs to materials either of exotic nature or not commonly fabricated for those equipment items.

A map of the U.S. showing average frost lines in inches will enable the user to more definitively scope differences in particular regions with respect to items which are heavily loaded in the concrete account. Costs for such items such as equalization basins and aeration systems can be adjusted further within the regional adjustments by examination and use of the frost line information shown.

Isotachs showing wind loadings throughout the U.S. will enable the user to vary costs within a particular regional location as a function of the expected windloadings and windspeeds for the particular location. Examination of some regions may show windloading variations between 67 to 120 miles per hour. All vertical type vessels will be greatly effected by these quantities and the isotachs should be considered in areas where high windloadings can be expected.

SECTION VI

SCOPE OF COST MANUAL'S UTILITY

The remaining sections of this USER MANUAL are devoted to the detailed presentation of recommended procedures for maximum utilization of the ENVIRONMENTAL PROTECTION COST MANUAL. In this section, a brief overview of each is given to introduce the user to the scope of the cost manual's utility.

The ENVIRONMENTAL PROTECTION COST MANUAL has been developed to permit the rapid manual conceptual estimation of:

1. The installed cost of individual installed equipment modules,
2. The annual cost of individual installed equipment modules,
3. The installed cost of environmental protection processes,
4. The annual cost of environmental protection processes, and
5. The potential profitability of environmental protection processes.

INSTALLED COST OF INDIVIDUAL INSTALLED EQUIPMENT MODULES

The cost data available to the user is presented in the accompanying DATA MANUAL. By design, the data summarizes in convenient, easily used graphical and tabular form the Mid-1972 installed cost of selected equipment modules. Each equipment module is defined so as to include an equipment item together with the accessories, foundations, etc. commonly associated with the equipment item in a "norm" or typical process application. The Mid-1972 installed cost represents the best available averages of the purchased cost of the equipment item, and accessories, the labor and material costs for installation of the item and accessories, as well as the contractor's engineering and overhead for the item as of Mid-1972. It does not include the contractor's fee, contingencies, or the cost of the land on which the equipment module is to be placed. The installed cost is presented as a function of the key cost parameter, generally a characteristic size for the equipment, and adjustment parameters relating to the location of the installation, material of construction, type of design, and pressure and temperature operating conditions. The user must choose the value of all required parameters before the installed equipment module cost can be determined and must recognize, and determine independently, any additional costs that may result from other than a "norm" application of the installed equipment module. The user must also determine independently the installed cost of equipment modules not given explicitly in the DATA MANUAL.

Suggested worksheets and example evaluations are presented in Section VII: ESTIMATION OF THE INSTALLED COST OF A SINGLE EQUIPMENT MODULE. The difficult problem of cost escalation is also addressed in this section, and a suggested worksheet is presented which incorporates a composite cost escalation factor based on the Marshall and Stevens Index and the Engineering News Record Construction Cost Index. The user must provide estimates of these indexes in order to reasonably escalate costs.

ANNUAL COST OF INDIVIDUAL INSTALLED EQUIPMENT MODULES

Estimation of the annual cost of individual installed equipment modules is considered in detail in Section VIII: ESTIMATION OF THE ANNUAL COST OF A SINGLE EQUIPMENT MODULE. Suggested worksheets together with illustrations are used to quantify the estimation procedure. The user must supply pertinent data relating to depreciation maintenance, operating labor, and utilities. For the convenience of the user, supplemental data is given in the DATA MANUAL for estimating depreciation, maintenance, and operating labor requirements. The installed cost of the individual equipment module serves as the starting point for the required evaluations.

INSTALLED COST OF ENVIRONMENTAL PROTECTION PROCESSES

The installed equipment module concept permits the installed cost of environmental protection processes to be estimated as the sum of the individual installed equipment module costs for those installed equipment modules present in the process. In Section IX: ESTIMATION OF INSTALLED PROCESS COST, the step-by-step procedure is considered in detail and is illustrated using two processes. The user must recognize, and independently determine, the installed cost of items which can not be evaluated using the DATA MANUAL. In addition, the user must specify the contingencies and contractor's fee as a percent of the bare plant cost and specify the cost of the land required. Major discrepancies in the estimate will occur if all items pertaining to the installed process are not included or if the application of installed equipment modules is for other than "norm" applications. To minimize the possibility of error, the user should use a detailed equipment list or a detailed flow diagram for the process and complete an item-by-item check when estimating the installed process cost.

ANNUAL COST OF ENVIRONMENTAL PROTECTION PROCESSES

Worksheets and illustrations are presented in Section X: ESTIMATION OF ANNUAL PROCESS COST for the estimation of the annual cost of environmental protection processes. Installed process cost serves as the starting point for the estimation. The recommended procedure parallels the approach used to estimate the annual cost of individual equipment modules, but is extended to include overall process factors such as raw materials, administrative personnel and staff, insurance and property taxes, etc. The user must have available knowledge of all pertinent utilities, raw materials, staff requirements, insurance and property tax rates, etc. Major discrepancies will occur if the user fails to consider all factors which may contribute to the annual process cost.

A detailed procedure is also presented for the determination of the depreciation schedule for the process and for the estimation of the annual tax credit. To quantify this information, the user must specify a depreciation method as well as the expected lifetime for tax purposes of the process. The total discounted tax credit of the process over its lifetime is detailed and may be evaluated by the user upon specification of the available interest rate on money. Supplemental depreciation rate data is presented in tabular form for the convenience of the user.

POTENTIAL PROFITABILITY OF ENVIRONMENTAL PROTECTION PROCESSES

The pertinent elements contributing to the estimation of the profit from a process are presented in worksheet form in Section XI: ESTIMATION OF PROFIT. The common indices of rate of return, payout time, gross profit, net profit, venture profit, and venture worth are evaluated if the suggested procedure is used.

The user must be able to estimate the annual process costs, the volume and price of sales, acceptable rate of return, income tax rate and certain other items pertaining directly to profit.

USE OF THE COST MANUAL

The user must accept the responsibility of insuring that all pertinent information has been included in the various estimates and that special items, that of necessity can not be included in a finite worksheet or finite group of data, are covered in his estimates.

The data and worksheets presented are designed to follow a hierarchy with profit estimation requiring annual process cost estimation, annual process cost estimation requiring installed process cost estimation, and installed process cost estimation requiring installed equipment module cost estimations. It is thus advisable for the user to examine the remaining sections of the USER MANUAL sequentially even though only one estimate such as a profit projection, is desired.

For the convenience of the user, numerous blank worksheets are given in Appendix A for each of the worksheets which have been developed.

SECTION VII

ESTIMATION OF THE INSTALLED COST OF A SINGLE EQUIPMENT MODULE

The information provided for the estimation of the installed cost (1972 dollars) of a single installed equipment module is presented in convenient, easy to use graphical and tabular form in the Data Manual. As a rapid scan of the Data Manual will reveal, two or more pages of information are included for each installed equipment module.

The first page generally contains all of the pertinent graphical and tabular data relating to the installed cost. The second page contains two items relating to the installed cost:

1. The definition of the module which indicates all of the elements which have been included in determining the installed base cost, and

2. The equation which relates the installed cost to the graphical and tabular data of installed base cost and required adjustment factors.

For the convenience of the user, the Data Manual contains an extensive index and cross reference to permit rapid access to the installed equipment module of interest.

The installed cost of each module is presented as a function of certain parameters, the exact nature of which depends on the particular module. These parameters must be supplied by the user.

For a number of the modules only two parameters are required to determine the installed cost. These parameters are:

1. The key cost parameter, and

2. The number of the EPA Region for which the estimate is to be made.

An example of a module of this type is the Equalization System (ES). For this module, the installed cost is graphically given as a function of the key cost parameter, capacity in millions of gallons per day, for EPA Region 1. This cost, since it pertains to Region 1 only, is called the installed base cost. In tabular form, the adjustment factor needed for the other EPA Regions is given. This regional adjustment factor is designated as F_R. As indicated on the second page of the data for ES, the installed cost in a given Region is obtained by multiplying the installed base cost by the regional adjustment factor. The Lagoon System (LS) and the Aeration System (AS) are other examples of this type of installed equipment module.

For the examples mentioned above, as well as all other modules, the term installed base cost refers to the installed cost in Region 1 for nominal applications of the module. In cases such as the Equalization System, Lagoon System, and Aeration System, all applications may be viewed nominal and thus only the regional adjustment is required. For most installed equipment modules, however, it is necessary to apply further adjustment factors as outlined below to account for other than nominal application. These adjustments may be given either in graphical or tabular form depending on the individual module.

1. Design adjustment factor F_D:

This factor is required because there may be several alternate physical designs for installed equipment modules having the same generic name. An example is the Blender (BL) which may be either a rotary or spiral ribbon design.

2. Material of construction factor F_M:

This factor is required because several alternate materials of construction may be used for that particular module. The Heat Exchanger (HE) is an example of this type of module.

3. Pressure adjustment factor F_P:

The pressure adjustment factor is required to account for design, and hence cost, differences which result because of the operating pressure of the module. An example of this type of module is the Ejector (EJ).

4. Temperature adjustment factor F_T:

Differences in operating temperature frequently cause differences in design and hence cost. The temperature adjustment factor is used to account for these differences as the module Freezer (FR) illustrates.

5. Other adjustment factors:

For selected installed equipment modules, it is convenient to define other adjustment factors to account for special characteristics of the individual module. The Roller Conveyer (CO-5) is an example where a width adjustment factor F_W is required. As another example, the Packed Column (TW-6) requires a packing type adjustment factor F_K.

A review of the adjustment factors together with the applicable equation relating installed cost to installed base cost is required to determine the exact definition of nominal application for each module.

In general, however, the simplest or most common design, carbon steel for construction, ambient pressure, and ambient temperature are the conditions chosen to reflect nominal application.

In several cases, such as the Vertical Tank (VT), the Heat Exchanger (HE-1, HE-2), and the Packed Tower (TW-5, TW-6, TW-7) modules, several adjustment factors are required and the nominal application may not be familiar to the user. To minimize the chance of error, each adjustment factor should be reviewed regardless of the amount of information available to the user.

The installed cost information included in the Data Manual was obtained using averages for typical installation schemes, "norm" material and labor requirements and costs for each installed equipment module as of mid-1972. Because costs may vary considerably with time, it is essential to not use the provided information in an indiscriminate manner to estimate costs for years other than mid-1972.

Escalation of the mid-1972 cost data presented in the Data Manual can be accomplished by application of the Marshall and Stevens Equipment Cost Index to escalate material (equipment and field material) costs into the future and the

Engineering News Record Construction Cost Index to escalate field labor into the future. A detailed procedure for doing this is discussed in the last portion of this Section.

It should be noted that cost escalation using the recommended procedure may be only approximate. Industrial innovations and marked changes in the ratio of labor and material requirements and costs may markedly change the cost of individual installed equipment modules from that projected using the averages reflected by the recommended procedure.

In any given year variation among vendors or contractors cost of individual installed equipment modules are inevitable. The presented data for Mid 1972 thus must not be viewed as absolute, but rather as the best average available for preliminary cost estimating.

To permit the most rapid use of the information presented, several work sheets have been developed. The nature of the work sheets depends on the complexity of the estimation procedure.

MODULES REQUIRING ONLY REGIONAL ADJUSTMENT

The suggested work sheet for equipment modules requiring only a regional adjustment is given in Table 1. To illustrate the use of this work sheet, consider the estimation of the installed cost of an equalization system to handle 2 million gallons per day in Region #3 as of 1972. As indicated in the completed work sheet given in Table 2, the following sequence of steps are successively completed:

1. The installed equipment module is specified. In this case it is Equalization System.
2. The appropriate data sheets are located and recorded. Simultaneously the definition and required factors are reviewed to insure that the appropriate data and work sheets have been selected.

TABLE 1

WORK SHEET #______ DATE:__________

ESTIMATION OF INSTALLED COST FOR A SINGLE INSTALLED EQUIPMENT MODULE (REGIONAL ADJUSTMENT FACTOR ONLY)

EQUIPMENT MODULE:________________________________

DATA SHEET NUMBERS:______________________________

KEY COST PARAMETER:______________ ( )

1972 INSTALLED BASE COST:........( )

ADJUSTMENT:

Regional......F_R = _____;#____

1972 INSTALLED COST =( )x($)=($)

INSTALLATION DATE:____________

COST ESCALATION FACTOR:________________;___

INSTALLED COST = ( ) x ($) = ($)
(Installation Date)

TABLE 2

WORK SHEET # 1 DATE: 3/16/73

ESTIMATION OF INSTALLED COST FOR A SINGLE INSTALLED EQUIPMENT MODULE
(REGIONAL ADJUSTMENT FACTOR ONLY)

EQUIPMENT MODULE: Equalization System

DATA SHEET NUMBERS: ES-1, ES-2

KEY COST PARAMETER: 2 (MGPD)

1972 INSTALLED BASE COST:........$(450,000)

ADJUSTMENT:

Regional······F_R = 0.947; # 3

1972 INSTALLED COST = (0.947) x ($450,000) = ($426,150)

INSTALLATION DATE: 1972

COST ESCALATION FACTOR: 1.000 ; –

INSTALLED COST = (1.000) x ($426,150) = ($426,000)
(Installation Date)

3. The value of the key cost parameter together with its units are then recorded. In this case, a system capable of handling 2 million gallons per day is desired. (It is essential that the key cost parameter be evaluted in the units specified on the data sheets. Frequently, conversion of the available data to the appropriate units may be required.)

   Referring to the Data Manual, a detention time of approximately 14 hours has been assumed to determine the capacity of the Installed Equalization System Module. Thus 1 million gallons per day capacity indicates approximately 2900 cubic yards of equalization system volume. If a detention time of 28 hours were desired for the example system, the installed base cost would have to be graphically evaluated using a capacity of 4 million gallons per day, rather than 2, to account for the doubling of the residence time and hence required volume.)

4. From the provided graph, the 1972 Installed Base Cost is evaluated knowing the key cost parameter. For the example chosen, a value of $450,000 is obtained.

5. Next the regional adjustment factor, F_R, is chosen from tabular data. For the example, it is round to be 0.947 for the Region #3. The value of F_R and the region number are noted.

6. 1972 Installed Cost is then computed as the product of the 1972 Installed Base Cost and the regional adjustment factor. At this point, the equation given on the second sheet of data is reviewed to insure that it confirms to the calculation made. For the example, a value of $426,150 is computed. (To minimize possible compounding of error after further computations, the figure $426,150 is retained rather than rounding to a value such as $426,000. As a general rule, rounding is reserved for the last step.)

7. Subsequently the installation date is recorded and the cost escalation factor, as detailed in the work given in Table 9, is evaluated. Since the installation date for the chosen example is 1972, the escalation factor is 1.00. Space is provided for noting the number of the work sheet used for this calculation if it is required.

8. Finally, the installed cost at the installation date is computed as the product of the cost escalation factor and the 1972 installed cost. For the example, this computation yields $426,150. Rounding, as the last step, to three significant figures gives the recorded value of $426,000.

MODULES REQUIRING MULTIPLICATIVE ADJUSTMENTS

The suggested work sheet for installed equipment modules having several factors which are multiplied by the installed base cost to yield the installed cost is given in Table 3. This work sheet is applicable to the majority of the installed equipment modules.

To illustrate the use of this work sheet, consider the estimation of the installed cost in 1972 of a 30 inch diameter, 20 tray,sieve tray tower designed of carbon steel for operation at 500 psig and 400°F in Region #5. As a line by line examination of the completed work sheet in Table 4 indicates, the estimation procedure consists of the following steps:

1. The installed equipment module is specified. In this case it is Tray Tower.

2. The appropriate data sheets are located and recorded. Simultaneously the definition and required factors are reviewed to insure that the appropriate data and work sheets have been selected.

3. The value of the key cost parameter together with its units are then recorded. For the example, the key cost parameter is the diameter of the column, namely 30 inches.

4. The graph of installed base cost versus key cost parameter is then reviewed to see if additional parameters must be specified before the installed base cost can be evaluated. For the Tray Tower Installed Equipment Module, it is seen that a second parameter, the number of trays, must be specified. Noting that 20 trays are desired in the example, the appropriate installed base curve, 20 trays, is recorded on the work sheet. (Many modules have only one characteristic curve as the Roller Conveyor, the Fan, and the Horizontal Tank modules illustrate. For others, including the Tray Tower and the Apron Conveyor modules, the characteristic curves are related directly to a physical characteristic such as number of trays or width. Occassionally, it is most convenient to relate the characteristic curves to the module design as the Pump and the Vertical Tank modules illustrate.)

TABLE 3

WORK SHEET #________ DATE:___________

ESTIMATION OF INSTALLED COST FOR A SINGLE INSTALLED EQUIPMENT MODULE
(ADJUSTMENT FACTORS ARE MULTIPLIED)

EQUIPMENT MODULE:_________________________

DATA SHEET NUMBERS:_______________________

KEY COST PARAMETER:______________________( )

CHARACTERISTIC INSTALLED BASE COST CURVE IF APPLICABLE ( )

1972 INSTALLED BASE COST: ($)

ADJUSTMENTS:

Regional.............. F_R = ;

_____________..........x = ;

_____________..........x = ;

_____________..........x = ;

_____________..........x = ;

_____________..........x = ;

ADJUSTMENT PRODUCT = ________

1972 INSTALLED COST = ( ) ($) = ($)

INSTALLATION DATE:__________

COST ESCALATION FACTOR:___________;_________

INSTALLED COST = ( ) x ( ) = ($)
(Installation Date)

TABLE 4

WORK SHEET # 2 DATE: 3/16/73

ESTIMATION OF INSTALLED COST FOR A SINGLE INSTALLED EQUIPMENT MODULE
(ADJUSTMENT FACTORS ARE MULTIPLIED)

EQUIPMENT MODULE: Tray Tower
DATA SHEET NUMBERS: TW-1, TW-2
KEY COST PARAMETER: 30 (in.)
CHARACTERISTIC INSTALLED BASE COST CURVE IF APPLICABLE (20 tray)
1972 INSTALLED BASE COST: ($ 62,000)

ADJUSTMENTS:

Regional.............. F_R = 1.080; #5
Design ....x F_D = 0.874; Sieve Tray
Material ....x F_m = 1.000; CS
Pressure ....x F_p = 1.25 ; 500 psig
Temperature..........x F_T = 1.00 ; 400°F
__________..........x = ;

ADJUSTMENT PRODUCT = 1.180

1972 INSTALLED COST = (1.180) ($62,000) = ($73,160)

INSTALLATION DATE: 1972

COST ESCALATION FACTOR: 1.000 ; —

INSTALLED COST = (1.000) x ($ 73,160) = ($73,000)
(Installation Date)

5. Having established the characteristic curve and the key cost parameter, the 1972 installed base cost is determined from the provided graph. For the example chosen a value of $62,000 is obtained.

6. The required adjustment factors are then reviewed again and each is subsequently evaluated using the provided graphical or tabular data. Each is simultaneously recorded. For the example Tray Tower module, five adjustment parameters are required. The regional adjustment factor, F_R, is found to be 1.080 for Region #5. The design adjustment factor, F_D, is found to be 0.874 for sieve trays. F_M, the material adjustment factor for carbon steel (CS) is 1.000. At 500 psig, the pressure adjustment factor, F_P, is evaluated as 1.25. The temperature adjustment factor, F_T, is found to be 1.00 for 400°F.

7. The product of the adjustment factors is next computed to yield a composite adjustment factor. For the example, a composite value of 1.180 is obtained.

8. The installed cost in 1972 is computed by multiplying the composite adjustment factor by the 1972 installed base cost. A value of $73,160 is obtained for the example.

9. The cost escalation factor is next considered. Since the installation date for the example is 1972, the value of this factor is 1.000. (See the work sheet given in Table 9 for the evaluation of the cost escalation factor if the installation date is other than 1972. Should the factor need to be evaluated, the work sheet number would also be recorded.)

10. The installed cost at the installation date is computed by multiplying the cost escalation factor by the 1972 installed cost. For the example, an installed cost of $73,160 is obtained. Rounding as the last step, to the nearest thousand yields the recorded value of $73,000.

MODULES REQUIRING ALTERNATE ADJUSTMENTS

Selected modules, including the Packed Column and the Centrifugal Pump modules, have specialized equations which relate the 1972 Installed Cost to the 1972 Installed Base Cost. To handle these modules, the generalized work sheet given in Table 5 is recommended. The chief distinction of this work sheet is that the appropriate equation relating installed to installed base costs is completed by the user on the basis of the particular module chosen.

To illustrate the use of this work sheet, consider evaluating the installed cost of a centrifugal pump in 1972 for Region #10.

Assuming that the pump is to be made of stainless steel type 304, is to be of heavy duty design, and is to be capable of delivering 50 gallons per minute at a head of 60 feet, the completed estimate as shown in Table 6 is readily made. The procedure consists of the following steps:

1. The installed equipment module is specified. For the example it is Centrifugal Pump.
2. The appropriate data sheets are located and recorded. Simultaneously the definition and required factors are reviewed to insure that the appropriate data and work sheets have been selected.
3. The value of the key cost parameter with its units are then recorded. For the example, the key cost parameter is the product of the design flow in gallons per minute and the required head in feet and is evaluated to be 3000 gpm-ft.
4. If more than one installed base curve is given, the appropriate one is selected and recorded. For the example this particular step is not applicable. (See the Packed Column module for an example for which this step would be required.)
5. The 1972 installed base cost is then evaluated using the characteristic installed base cost curve and the value of the key cost parameter. For the example, the 1972 installed base cost is estimated as $5,100.
6. The required adjustment factors are next reviewed again and each is subsequently evaluated using the provided graphical or tabular data. Each is simultaneously recorded. For the example, the regional adjustment factor, F_R, for Region #10

TABLE 5

WORK SHEET # DATE: ____________

ESTIMATION OF INSTALLED COST FOR A SINGLE INSTALLED EQUIPMENT MODULE
(GENERALIZED WORK SHEET)

EQUIPMENT MODULE: ______________________________
DATA SHEET NUMBERS: ____________________________
KEY COST PARAMETER: ____________________________ (   )
CHARACTERISTIC INSTALLED BASE COST CURVE IF APPLICABLE (   )
1972 INSTALLED BASE COST: ($)

ADJUSTMENTS:

Regional.................. F_R =   ;
____________________.......... =   ;
____________________.......... =   ;
____________________.......... =   ;
____________________.......... =   ;

OTHER PARAMETERS:

____________________.......... =   ;
____________________.......... =   ;
____________________.......... =   ;

CHARACTERISTIC ADJUSTMENT EQUATION:

1972 INSTALLED COST = (1972 Installed Base Cost)____________________

1972 INSTALLED COST = (______________________________) = ($)

INSTALLATION DATE: ____________
COST ESCALATION FACTOR: ______; ______
INSTALLED COST = (   ) x (   ) = ($)
(installation date)

TABLE 6

WORK SHEET # 3 DATE: 3/16/73

ESTIMATION OF INSTALLED COST FOR A SINGLE INSTALLED EQUIPMENT MODULE
(GENERALIZED WORK SHEET)

EQUIPMENT MODULE: Centrifugal Pump
DATA SHEET NUMBERS: CP-1, CP-2
KEY COST PARAMETER: 3000 (GPM-FT)
CHARACTERISTIC INSTALLED BASE COST CURVE IF APPLICABLE (—)
1972 INSTALLED BASE COST: ($ 5,100)

ADJUSTMENTS:

Regional.................... F_R = 1.030; #10
Material.......... F_M = 0.047; SS304
Design.......... F_D = 1.101; HD
.... = ;
.... = ;

OTHER PARAMETERS:

.... = — ;
.... = ;
.... = ;

CHARACTERISTIC ADJUSTMENT EQUATION:

1972 INSTALLED COST = (1972 Installed Base Cost) $(F_D + F_M)\,F_R$

1972 INSTALLED COST = ($5,100 (1.101 + 0.047) 1.030) = ($6,030)

INSTALLATION DATE: 1972
COST ESCALATION FACTOR: 1.000 ; —
INSTALLED COST = (1.000) x ($6,030) = ($6,030)
(installation date)

is 1.030; the material adjustment factor, F_M, for SS304 is 0.047; and the design adjustment factor, F_D, for heavy duty is 1.101.

7. The data sheet is reviewed once again to see if any additional parameters are required. For the example centrifugal pump installed equipment module there are none. (This is not always the case. The Packed Column module, for example, requires that the packing volume be given in the units of cubic feet.)

8. The next step is to record the characteristic adjustment equation, taken from the last data sheet for the module, which relates the 1972 Installed Cost to the 1972 Installed Base Cost. For the example module, it is found that the 1972 Installed Base Cost must be multiplied by $(F_D + F_M)$and F_R to obtain the 1972 Installed Cost.

9. The 1972 installed cost is then computed using the characteristic adjustment equation. A value of $6,030 is obtained for the example centrifugal pump module.

10 The cost escalation factor is next considered. Since the installation date for the example is 1972, the value of this factor is 1.000. (See the work sheet given in Table 9 for the evaluation of the cost escalation factor if the installed date is other than 1972. Should the factor need to be evaluated, the work sheet number would also be recorded.)

11. The installed cost at the installation date is computed by multiplying the cost escalation factor by the 1972 installed cost. For the example, an installed cost of $6,030 is obtained.

ESCALATION OF INSTALLED COSTS

Escalation of the installed equipment module costs estimated from the Data Manual is required if the installation date is other than Mid 1972. Since this will frequently be the case, the user should not minimize the importance, nor the difficulty, of cost escalation.

Industrial innovations, design changes, different escalation rates for individual classes of labor and material costs, varying labor and material requirements, and the uncertainties of predicting future economic indicators preclude a definitive escalation of installed equipment module costs. As a suggested reasonable procedure for the escalation of installation costs, a cost escalation factor which considers the labor to material ratio in an installed equipment module, the Process Industries Average Marshall and Stevens Index, and the Engineering News Record Construction Cost Index has been developed. For the convenience of the user, the range of the labor to material ratio for selected installed equipment modules is presented in Table 7. The range results because of changes in the labor to material ratio with size, design, etc. In Table 8, the values of the Marshall and Stevens Index and the Engineering News Record Construction Cost Index from 1950 to date are summarized. These latter values may be extrapolated into the future at the user's own risk. The cost data in the Data Manual were developed when the Marshall and Stevens Index was 330.0 and the Engineering News Record Index was 1744.0.

The suggested procedure depends on whether or not the labor to material ratio can be estimated.

TABLE 7

LABOR TO MATERIAL RATIO FOR SELECTED INSTALLED EQUIPMENT MODULES

Installed Equipment Module	L/M
Air Compressors	0.330 - 0.872
Air Conditioning Units	1.332
Air Dryers	0.767
Agitated Open Tanks	0.410 - 0.592
Agitated Pressure Tanks	0.299 - 0.571
Condensers	0.437 - 0.643
Conveyers	0.966 - 1.147
Centrifugal Pumps	0.414 - 0.483
Crushers	0.988 - 1.113
Crystallizers	0.952 - 1.031
Centrifuges	0.968 - 1.021
Cutters	0.859 - 0.965
Dryers	0.825 - 0.937
Dust Collectors	0.755 - 0.838
Drum Dryers	0.837 - 0.846
Evaporators	0.336 - 0.695
Electrical Generators	1.224 - 1.389
Ejectors	0.868 - 0.898
Elevators	0.886
Extractors	0.962 - 0.975
Filters	0.992 - 1.121
Feeders	0.997 - 1.083
Fans	0.987 - 1.049
Flakers	0.829
Flotation Machines	1.021 - 1.084
Freezer	1.000
Furnaces	0.616 - 0.674

TABLE 7 (CONTINUED)

Gas Compressors	0.448 - 0.870
Gear Pumps	0.394 - 0.410
Heat Exchangers	0.227 - 0.766
Electric Heater	0.389 - 0.563
Heating Units	0.385 - 0.580
Hoists	0.706 - 0.729
Horizontal Tanks	0.405 - 0.586
Incinerators	0.924 - 0.965
Ion Exchangers	0.579 - 0.652
Kneaders	1.038 - 1.049
Mills	0.990 - 1.151
Mixers	1.040 - 1.196
Packaging Machine	0.889 - 1.047
Packed Columns	0.292 - 0.740
Presses	1.040 - 1.062
Pumps	0.318 - 0.720
Reactors	0.611 - 0.735
Rotary Dryers	0.898 - 0.956
Scales	1.000
Stacks	0.937 - 0.995
Turbines	0.937
Tray Towers	0.435 - 0.581
Vacuum Pumps	0.437 - 0.705
Vertical Tanks	0.252 - 1.142
Vibrating Screens	1.189 - 1.270

TABLE 8

VALUES OF SELECTED COST INDICES

Year	Marshall and Stevens Process Industries, Average (1926 = 100)	Engineering News Record Construction Cost Index (1913 = 100)
1950	167	510
1951	178	543
1952	179	569
1953	181	600
1954	184	628
1955	189	660
1956	206	690
1957	224	724
1958	228	759
1959	232	797
1960	237	824
1961	236	847
1962	237	872
1963	238	901
1964	241	936
1965	244	971
1966	252.2	1021; 995.1, Jan. 13
1967	262.9	1043.3; Jan. 19
1968	273.1	1116.9, Jan. 18
1969	285.0	1222.9, Jan. 16
1970	303.3	1310.2, Jan. 15
1971	321.3	1465.5, Jan. 14
1972	326.8, 1st Quarter 330.6, 2nd Quarter 334.1, 3rd Quarter 336,7, 4th Quarter 330.0, Data Manual Costs	1664.4, Jan. 17 1744.0, Data Manual Costs
1973		1828.2, Jan. 11

The most recent values are to be found in the regular reports "Economic Indicators" published in Chemical Engineering.

For known labor to material ratios:

$$IC_x = IC_{Mid'72} \, [(1. - 0.5 \, (L/M)(\frac{MS_x}{330.0}) + 0.5 \, (L/M)(\frac{ENR_x}{1774.0})] \qquad 23)$$

and, as a conservative estimate for cases where (L/M) is unknown:

$$IC_x = IC_{Mid'72} \, (\frac{ENR_x}{1744.0}) \qquad 24)$$

where

IC_x = Estimated installed cost of installed equipment module in Year X

$IC_{Mid\ '72}$ = Estimated installed cost of installed equipment module as of Mid 1972, the value relating to the point in time when the cost data was developed for the Data Manual

(L/M) = Labor to material ratio, dependent on installed equipment module as tabulated in Table 7

MS_x = Marshall and Stevens Index, Process Industries Average with (1926 = 100), for Year X. Cost data was developed for the Data Manual at a point in time when $MX_x = 330.0$

ENR_x = Engineering News Record Construction Cost Index with (1913 = 100) for Year X. Cost data in the Data Manual was developed when $ENR_x = 1744.0$

A suggested worksheet is presented in Table 9 for the escalation of the installed cost of a single installed equipment module. In Table 10 the procedure is illustrated by considering the escalation of the 1972 installed Tray Tower Module cost calculated in Table 4 to conditions where the MS Index is

TABLE 9

WORK SHEET #______ DATE:_____

EVALUATION OF THE COST ESCALATION FACTOR

EQUIPMENT MODULE ____________________

INSTALLED EQUIPMENT MODULE COST (Mid 1972) ________ ;Work Sheet #____

INSTALLATION DATE ________

MS INDEX AT INSTALLATION DATE __________

(1946 = 100)

(L/M) RATIO ________

MS ESCALATION FACTOR =(1.-0.5(   ))(/330) = (   )

(Set to 0.0 if (L/M) is not known)

ENR INDEX AT INSTALLATION DATE _________

(1913 = 100)

(L/M) RATIO ________

ENR ESCALATION FACTOR = 0.5(   )(/1744) = (   )

(Set to 1.0 if (L/M) is not known)

COST ESCALATION FACTOR = (+   ) = (   )

ESTIMATED INSTALLED COST AT INSTALLATION DATE = (   )x(   )=($)

TABLE 10

WORK SHEET # 4 DATE: 3/16/73

EVALUATION OF THE COST ESCALATION FACTOR

EQUIPMENT MODULE Tray Tower

INSTALLED EQUIPMENT MODULE COST (Mid 1972) $73,160 ;Work Sheet # 2

INSTALLATION DATE 19XX

MS INDEX AT INSTALLATION DATE 340.0

(1946 = 100)

(L/M) RATIO 0.50

MS ESCALATION FACTOR =(1.-0.5(0.5))(340/330) = (0.773)

(Set to 0.0 if (L/M) is not known)

ENR INDEX AT INSTALLATION DATE 1850.0

(1913 = 100)

(L/M) RATIO 0.50

ENR ESCALATION FACTOR = 0.5(0.50)(1850/1744) = (0.265)

(Set to 1.0 if (L/M) is not known)

COST ESCALATION FACTOR = (0.265 + 0.773) = (1.038)

ESTIMATED INSTALLED COST AT INSTALLATION DATE = (1.038) x (73,160) = ($75,940)

340.0 and the ENR Index is 1850.0. A (L/M) ratio of 0.50 is assumed. An installed cost of $75,940 is obtained compared to $73,160 for Mid 1972.

SECTION VIII

ESTIMATION OF THE ANNUAL COST OF A SINGLE INSTALLED EQUIPMENT MODULE

As discussed in detail in the review in Section IV , POLLUTION CONTROL ECONOMICS, annual costs may be broken into four categories:

1. Fixed charges,

2. Direct operating costs,

3. Indirect operating costs, and

4. If applicable, the tax credit arising from the depreciable investment.

For a single installed equipment module, all of the separate elements in these categories are not directly applicable. Several are best applied to the process as a whole.

In Table 11 a suggested worksheet for the chief elements contributing to the annual cost of a single installed equipment module is given.

The worksheet is self-explanatory. However, a few points are worthy of examination from the standpoint of easing its use.

1. The estimate of the installed cost can generally be obtained using the procedure discussed in Section VII: ESTIMATION OF THE INSTALLED COST OF A INDIVIDUAL INSTALLED EQUIPMENT MODULE.

2. Salvage value is generally assumed zero, unless definitely warranted otherwise.

3. A table of the range of the expected lifetime of the individual installed equipment modules is presented in the Data Manual. In the Data Manual, classification as to industry type is given to aid the user.

TABLE 11

WORK SHEET #__________ DATE:__________

ESTIMATION OF THE ANNUAL COST OF A SINGLE INSTALLED EQUIPMENT MODULE

INSTALLED EQUIPMENT MODULE __________________________
INSTALLED COST ($) ; Worksheet # __________
SALVAGE VALUE -($ ______)
DEPRECIABLE INVESTMENT...($)
USEFUL LIFETIME ____ years
SINKING FUND INTEREST RATE____ %/yr.
SINKING FUND FACTOR...( )
FIXED CHARGE DEPRECIABLE INVESTMENT = ( )x($) =($)
FIXED CHARGE NONDEPRECIABLE SALVAGE VALUE = ( )x($) =-($)
Salvage Value
MAINTENANCE AS FRACTION OF INSTALLED COST = ( )
DIRECT OPERATING COST FOR MAINTENANCE = ( ) x ($) =($)
OPERATORS REQUIRED PER SHIFT ....( )
SHIFTS PER DAY....................... ( )
ANNUAL OPERATOR SALARY + BURDEN =($)
ANNUAL OPERATOR COST =($)x( )x( ) =($)
SUPERVISOR REQUIRED PER SHIFT........... ( )
SHIFTS PER DAY ....( )
ANNUAL SUPERVISOR SALARY + BURDEN______
ANNUAL SUPERVISOR COST =($)x( )x( ) =($)
FOREMAN REQUIRED PER SHIFT...................( )
SHIFTS PER DAY.........................( )
ANNUAL FOREMAN SALARY + BURDEN =($)
ANNUAL FOREMAN COST =($)x( )x( ) =($)

UTILITY	QUANTITY PER YEAR	UNIT PRICE	COST PER YEAR
________	( )x	( )=	($)
________	( )x	( )=	($)
________	( )x	( )=	($)
________	( )x	( )=	($)

DIRECT OPERATING COST FOR UTILITIES =($)
TAX DEPRECIATION METHOD STRAIGHT LINE
DEPRECIATION LIFETIME____ years
DEPRECIATION RATE PER YEAR( )
INCOME TAX RATE ( )
TAX CREDIT = ( )x( )x( )=($)
TAX CREDIT CONTRIBUTION TO ANNUAL COST =-($) =-($)
ESTIMATED ANNUAL COST =($)

4. An extensive table of the sinking fund factor for a range of expected lifetime and interest rates is given in Appendix B.

5. Only the fixed charges for depreciable capital investment and (the credit) for the salvage value are considered.

6. Maintenance including all labor, materials, and supplies is assumed to be a fraction of the installed module cost. For the convenience of the user, the approximate range of this fraction is given in the Data Manual for each installed equipment module.

7. Operators, supervisors, and foremen have been included in estimating the labor for operating. For the convenience of the user, the approximate range of the operator requirements is given in the Data Manual for each installed equipment module. It should be noted that these requirements may vary markedly with the type of industry and some background should be reviewed before the specification is completed. The cost for supervisors and foremen is included for completeness, realizing that they are more applicable to larger portion of the process than a single installed equipment module.

8. The utilities required may be listed separately and the total cost for utilities evaluated if the quantity per year and the unit price of each is specified by the user.

9. Raw materials requirements are not listed as they apply more directly to the entire process.

10. Straight line depreciation is assumed in the evaluation of the tax credit because the other methods of depreciation result in rates which change with time. Appendix C may be used to find the appropriate straight line rate once the depreciation lifetime is specified.

EXAMPLE

To illustrate the procedure for estimating the annual cost of a single installed equipment module consider the installed Tray Tower Module used previously in Table 4 to review the estimation of 1972 installed costs. The completed worksheet in

Table 12 will be used for this illustration. Reviewing the worksheet item by item, the estimation of the annual cost consists of the following items:

1. The installed equipment module under consideration, Tray Tower, is noted.

2. The installed cost of the equipment module as well as the worksheet used for its evaluation are recorded. For the Tray Tower module, the installed cost is estimated to be $73,160 as determined using Worksheet #2 given in Table 4. It is pertinent to note that this estimate does not include a reboiler or a condenser for the tower.

3. The salvage value is then estimated. For purpose of preliminary estimating, a value of zero is assumed.

4. The depreciable capital investment is computed as the difference between the installed cost and the salvage value.

5. The expected useful lifetime in years is estimated. Reference to the Data Manual for the Tray Tower Module indicates that the expected lifetime is generally in the range from 10 to 18 years depending on the application as approximated by the indicated industry groups. For purposes of illustration, 12 years is chosen.

6. The interest rate available for the sinking fund is recorded next. A rate of 6%/yr. is assumed for the example.

7. The sinking fund factor is then determined from Appendix B for the particular useful lifetime (i.e. depreciation period) and interest rate available. For 12 years at 6% per year, a value of 0.05928 is obtained.

8. The annual fixed charge for the depreciable capital investment is computed as the product of the sinking fund factor and the depreciable capital investment. A value of $4337 is obtained for the example.

9. The annul credit for the salvage value is computed as the product of the sinking fund factor and the salvage value. For the example, this credit is zero. (Other

TABLE 12

WORK SHEET # 5　　DATE: 3/16/73

ESTIMATION OF THE ANNUAL COST OF A SINGLE INSTALLED EQUIPMENT MODULE

INSTALLED EQUIPMENT MODULE Tray Tower

INSTALLED COST ($73,160) ; Worksheet # 2

SALVAGE VALUE -($ 0)

DEPRECIABLE INVESTMENT..................($73,160)

USEFUL LIFETIME 12 years

SINKING FUND INTEREST RATE 6 %/yr.

SINKING FUND FACTOR..................(0.05928)

FIXED CHARGE DEPRECIABLE INVESTMENT = (0.05928)x($73,160) =($4,337)

FIXED CHARGE NONDEPRECIABLE SALVAGE VALUE = (0.05928)x($ 0) =-($ 0)

Salvage Value

MAINTENANCE AS FRACTION OF INSTALLED COST = (0.08)

DIRECT OPERATING COST FOR MAINTENANCE = (0.08) x ($73,160) =($5,853)

OPERATORS REQUIRED PER SHIFT ....(0.25)

SHIFTS PER DAY.................. (3)

ANNUAL OPERATOR SALARY + BURDEN =($10,000)

ANNUAL OPERATOR COST =($10,000)x(3)x(0.25) =($7,500)

SUPERVISOR REQUIRED PER SHIFT............ ( )

SHIFTS PER DAY ....( )

ANNUAL SUPERVISOR SALARY + BURDEN______

ANNUAL SUPERVISOR COST =($)x( )x( ) =($ —)

FOREMAN REQUIRED PER SHIFT..................( )

SHIFTS PER DAY..................( )

ANNUAL FOREMAN SALARY + BURDEN =($)

ANNUAL FOREMAN COST =($)x( )x( ) =($ —)

UTILITY	QUANTITY PER YEAR		UNIT PRICE		COST PER YEAR
______	( )	x	( )	=	($)
______	( )	x	( )	=	($)
______	( )	x	( )	=	($)
______	( )	x	( )	=	($)

DIRECT OPERATING COST FOR UTILITIES =($ —)

TAX DEPRECIATION METHOD STRAIGHT LINE

DEPRECIATION LIFETIME 12 years

DEPRECIATION RATE PER YEAR (0.0833)

INCOME TAX RATE (0.50)

TAX CREDIT = (0.50)x(0.0833)x($73,160)=($3,047)

TAX CREDIT CONTRIBUTION TO ANNUAL COST =-($3,047) =-($3,047)

ESTIMATED ANNUAL COST =($14,643)

annual fixed charges such as rent, insurance, etc. discussed in Section IV: POLLUTION CONTROL ECONOMICS are considered more appropriate at the process level and thus are not included in the itemization for a single installed module in the provided worksheet. The user may choose to include them however if they can be isolated for the individual installed equipment module).

10. Annual maintenance including labor, materials, and supplies is next estimated as a fraction of the installed equipment module cost. In the Data Manual, the approximate range of this fraction is given for each installed equipment module. For the Tray Tower module, this is estimated to range from 7.35 to 10.71 percent with variation even outside this range depending on the operating conditions, the material being processed, and the type of industry. For purposes of illustration, 8%/yr. is chosen.

11. The annual direct operating cost for maintenance is computed using the installed cost and the annual rate per unit of installed cost. For the example, $5,853 is computed.

12. The operator requirements per shift for the installed equipment module are then estimated. Referring to the Data Manual, approximately 0.25 operators are required per shift for the Tray Tower module. Variation because of operating conditions and material being processed can be expected within the various industry groups.

13. The number of shifts per day for which operators are required is noted next. For purposes of illustration three are assumed.

14. The annual cost of a single operator, including hourly wages, salary, and overhead burden as appropriate, is recorded under ANNUAL OPERATOR SALARY AND BURDEN. For illustration, $10,000 is chosen.

15. The annual cost of operating labor is then computed as the product of the operator requirements per shift, number of shifts per day, and annual cost per operator. For the example a value of $7,500 is obtained.

16. to 23. The annual cost of supervisors and foremen is most appropriately handled on the process level. For completeness, however, the user may choose to include the fractional allotment to individual equipment modules in the worksheet.

24. The annual individual requirements for each utility (fuel, power, steam, cooling water, process water, compressed air, etc. with subcategories for natural gas, coal, heating oil, gasoline, etc.) may then be listed together with the per unit price which must be paid. From knowledge of the quantity required per year and the unit price, the cost per year of each utility is computed. For the Tray Tower module, utility requirements would probably be minimal. Provisions for tower platform lighting, electricity and compressed air for controls, etc. would probably be made on an overall process basis. Major utility costs such as cooling water for a condenser, steam for a reboiler, steam for a jet to maintain a vacuum within the Tray Tower module, etc. would be included in the analysis of the appropriate modules which may be associated with the Tray Tower module.

25. The total annual direct operating cost for utilities is obtained by summing the individual requirements.

26. To permit a rapid estimate of the annual tax credit, straight line depreciation is assumed. Use of another depreciation method would result in a credit which would vary throughout the lifetime of the equipment module.

27. The lifetime for tax purposes is first noted. A value of 12 years is assumed for the example.

28. The depreciation rate per year, assuming straight line depreciation, is obtained from Appendix C. For a lifetime of 12 years, a value of 0.0833 is obtained.

29. The income tax rate, federal, state, local as required, is next noted. For the example 0.50 is assumed.

30. The annual tax credit is computed as the product of the depreciation rate, the income tax rate, and the depreciable capital investment.

31. The tax credit is then noted to result in a reduction of the annual cost. For the example, the reduction computed is $3,047.

32. The annual cost of the single installed equipment module is then computed as the sum of the contributions from lines 8, 9, 11, 15, 19, 23, 25, and 31. For the example, a value of $14,643 is obtained.

SECTION IX

ESTIMATION OF INSTALLED PROCESS COST

In the accompanying Data Manual, installed equipment modules reflecting the "norm" or typical application of individual equipment items in a process system are defined and cost data are given for each. By determining the equipment modules required to describe the process system under consideration, costing each module, and summing the module costs together with costs not included in the modules, a reasonable estimate of the installed process cost can be obtained by a convenient, easy-to-use manual procedure. Notable limitations of this technique relating to what constitutes "norm", are discussed in Section III: INTRODUCTION.

Before using the technique developed, it is essential to know which costs have and which costs have not been included in the module costs.

The cost data for the installed individual equipment modules presented in the Data Manual are best described as being the contribution to the 1972 bare plant cost of individual process equipment items. (The exact cost elements included vary somewhat because of equipment type and thus are summarized in the Data Manual for each module.) Consequently, the given installed module costs include in 1972 dollars:

1. Cost of purchased equipment required for the module,
2. Cost of equipment handling, field erection, piping, concrete, steel, instrumentation, electrical, insulation, and paint required for installation of the module,
3. Prime contractor engineering for the module, and
4. Construction overhead as required for the module.

Costs which are not included and which must be independently investigated and used together with the equipment module costs in order to reasonably estimate the installed process cost are:

1. The cost of specialized equipment modules not included in the Data Manual (see the Data Sheet Index in the Data Manual for listings of those equipment modules which are available),
2. The cost of items which are over and above those incorporated in a "norm" application of the equipment module (this would include special piping, instrumentation, etc.),
3. The cost of subcontracted elements such as buildings, service facilities, etc,
4. The cost of buildings,
5. The cost of yard improvements,
6. The cost of auxiliary and service facilities,
7. The cost of land,
8. The contractor's fee,
9. The amount allocated for contingencies, and
10. The escalation of costs for an installation date other than Mid 1972.

Item numbers 1 to 7 ennumerated above are determined on the basis of the particular facility, type of facility, and location chosen. The contractor's fee and contingencies are negotiated costs with the contractor's fee generally in the range of 2 to 7 percent of the direct and indirect costs,and contingencies generally in the range of 8 to 20 percent of the sum of direct plus indirect costs.

The recommended procedure for escalating the 1972 installed equipment module costs is discussed in detail in Section VII: ESTIMATION OF THE INSTALLED COST OF A SINGLE INSTALLED EQUIPMENT MODULE.

In Table 13, a suggested work sheet for the estimation of the installed process cost is given. Use of the worksheet involves

TABLE 13

WORK SHEET #________ DATE:____________

ESTIMATION OF THE INSTALLED PROCESS COST

PROCESS____

INSTALLED EQUIPMENT MODULE	INSTALLED COST
____________;Worksheet #_____	($)
____________;Worksheet #_____	($)
____________;Worksheet #_____	($)
____________;Worksheet #_____	($)
____________;Worksheet #_____	($)

TOTAL INSTALLED EQUIPMENT MODULES COST =($)

SPECIAL ITEMS	INSTALLED COST
______________________________	($)
______________________________	($)
______________________________	($)
______________________________	($)
______________________________	($)

TOTAL SPECIAL ITEMS INSTALLED COST =($)

BARE PLANT COST =($)

PERCENT CONTINGENCIES OF BARE PLANT COST _____

CONTINGENCIES = (/100)x($) =($)

CONTRACTORS FEE AS A PERCENT OF BARE PLANT COST ______

CONTRACTORS FEE = (/100)x($) =($)

COST OF LAND =($)

TOTAL INSTALLED COST =($)

the following chief steps:

1. Itemization of each installed equipment module and its installation cost at the installation date. The work sheets given in Tables 1, 3, 5, and 9 may be used as applicable for the estimation of the individual installed equipment module cost. If the list of modules is lengthy, the work sheet given in Table 14 may be used for the evaluation of subtotals.

2. The addition of the individual installed equipment modules cost to obtain the total installed equipment modules cost.

3. Itemization of the installed cost of each special item such as additions, subcontracts, cost of buildings, cost of yard improvements, and cost of auxiliary and service facilities. If this list is lengthy, the work sheet given in Table 15 may be used for the evaluation of subtotals.

4. The addition of all the installed costs of the special items to obtain the total special items installed cost.

5. Computation of the bare plant cost as the sum of the total installed equipment modules cost and the total special items installed cost.

6. Specification of the contingencies as a percent of the bare plant cost.

7. Calculation of the cost for contingencies.

8. Specification of the contractor's fee as a percent of the base plant cost.

9. Calculation of the contractor's fee.

10. Specification of the land cost.

11. Calculation of the total installed cost as the sum of the land cost, the contractor's fee, contingencies, and the base plant cost.

TABLE 14

WORKSHEET #______________ DATE____________________

PROCESS____

INSTALLED EQUIPMENT MODULE	INSTALLED COST
____________; Worksheet #____________	($)
____________; Worksheet #____________	($)
____________; Worksheet #____________	($)
____________; Worksheet #____________	($)
____________; Worksheet #____________	($)
____________; Worksheet #____________	($)
____________; Worksheet #____________	($)
____________; Worksheet #____________	($)
____________; Worksheet #____________	($)
____________; Worksheet #____________	($)
____________; Worksheet #____________	($)
____________; Worksheet #____________	($)
____________; Worksheet #____________	($)
____________; Worksheet #____________	($)
____________; Worksheet #____________	($)
____________; Worksheet #____________	($)
____________; Worksheet #____________	($)
____________; Worksheet #____________	($)
____________; Worksheet #____________	($)
____________; Worksheet #____________	($)
____________; Worksheet #____________	($)
____________; Worksheet #____________	($)

SUBTOTAL INSTALLED EQUIPMENT MODULES COST	($)

TABLE 15

WORKSHEET # ____________________ DATE ____________________

PROCESS ____

SPECIAL ITEMS	INSTALLED COST
	($)
	($)
	($)
	($)
	($)
	($)
	($)
	($)
	($)
	($)
	($)
	($)
	($)
	($)
	($)
	($)
	($)
	($)
	($)
	($)
SUBTOTAL SPECIAL ITEMS INSTALLED COST	($)

EXAMPLE NUMBER 1

To illustrate the use of this work sheet and the information required for its use, consider the following example:

It is desired to estimate the total 1972 installed cost Region #1 of a wastewater lagoon treatment process. The process consists of three major parts:

1. The lagoon for which the installed cost, for excavation and reseeding, is known to be $22,800,
2. Lagoon piping for which the installed cost is known to be $1,120,
3. A pump building for which it has been determined that:
    a. The subcontract cost to build the building is $4,300,
    b. Flow samplers will be installed at a cost of $3,600,
    c. Laboratory equipment totaling $1,800 will be placed in the building, and
    d. Two identical 10 psig rotary blowers, each with a capacity of 240 cubic feet per minute, will be installed in the building, and
4. Contingencies are estimated to be 10% of the bare plant cost; the contractor's fee to be 3% of the bare plant cost; and the land required for the process is available.

In Table 16, the steps involved in computing the total installed cost of this process are given. First, the installed cost of the rotary blowers are estimated, using the work sheet given in Table 17, from the data in the Data Manual. An installed cost of $6,800 in obtained for each. Next, the special items are listed. The lagoon installed cost is known and thus need not be estimated. Likewise, the flow samplers,laboratory equipment and pump building construction costs are known. And, as the last item, the installed cost of the lagoon piping is included recognizing that the "norm" piping on the blowers would not include this special piping. The total for the installed special items is found to be $33,620.

TABLE 16

WORK SHEET # E1-1   DATE: 3/16/73

ESTIMATION OF THE INSTALLED PROCESS COST

PROCESS Wastewater Lagoon Treatment

INSTALLED EQUIPMENT MODULE		INSTALLED COST
Fan #1	;Worksheet # E1-2	($ 6,800)
Fan #2	;Worksheet # E1-2	($ 6,800)
	;Worksheet #	($)
	;Worksheet #	($)
	;Worksheet #	($)

TOTAL INSTALLED EQUIPMENT MODULES COST =($13,600)

SPECIAL ITEMS	INSTALLED COST
Lagoon Excavation + Reseeding	($ 22,800)
Flow Samplers	($ 3,600)
Laboratory Equipment	($ 1,800)
Lagoon Piping	($ 1,120)
Subcontracted Pump Building	($ 4,300)

TOTAL SPECIAL ITEMS INSTALLED COST =($33,620)

BARE PLANT COST =($47,220)

PERCENT CONTINGENCIES OF BARE PLANT COST 10

CONTINGENCIES = (10 /100)x($47,220) =($4,722)

CONTRACTORS FEE AS A PERCENT OF BARE PLANT COST 3

CONTRACTORS FEE = (3 /100)x($47,220) =($1,417)

COST OF LAND =($ —)

TOTAL INSTALLED COST =($53,359)

TABLE 17

WORK SHEET # E1-2   DATE: 3/16/73

ESTIMATION OF INSTALLED COST FOR A SINGLE INSTALLED EQUIPMENT MODULE
(ADJUSTMENT FACTORS ARE MULTIPLIED)

EQUIPMENT MODULE: F3N (#1)
DATA SHEET NUMBERS: FN-1, FN-2
KEY COST PARAMETER: 240 (CFM)
CHARACTERISTIC INSTALLED BASE COST CURVE IF APPLICABLE (—)
1972 INSTALLED BASE COST: ($ 4,000)

ADJUSTMENTS:

Regional.............. F_R = 1 ; #1
Design ....x F_D = 1.692 ; Rotary Blower
Pressure ....x F_P = 1 ; 10 psig
__________..........x = ;
__________..........x = ;
__________..........x = ;

ADJUSTMENT PRODUCT = 1.692

1972 INSTALLED COST = (1.692) ($ 4,000) = ($6,768)

INSTALLATION DATE: 1972

COST ESCALATION FACTOR: 1.000 ; —

INSTALLED COST = (1.000) x ($6,768) = ($6,800)
(Installation Date)

The bare plant cost is then computed to be $47,220. Contingencies, computed as 10% of the bare plant cost, are $4,722. The contractor's fee, computed as 3% of the bare plant cost, is $1,417. Noting that that the land cost is zero, the total installed cost is estimated to be $53,400 by summing the bare plant cost, the contingencies, and the contractor's fee.

This compares very favorably to the actual installed cost of $48,500 for this facility (Kent Cheese Company EPA Grant 12060 DXF).

EXAMPLE NUMBER 2

As a second example illustrating the procedure for estimating installed process cost, a treatment system for dyestuff and organic chemical wastes has been chosen. For convenience, the following process elements have been identified:

1. Thiosulfate oxidation
2. Ammonia storage
3. Phosphoric acid storage
4. Acid equalization
5. Limestone system
6. Settling basin
7. Alkaline equalization
8. Alkaline oxidation
9. Clarification
10. Control room and laboratory
11. Chlorination
12. Final settling
13. Post aeration basin

In Worksheet E2-21 given in Table 18, the 1972 installed costs of individual installed equipment modules, as determined

TABLE 18

WORKSHEET # E2-21 DATE 3/16/73

PROCESS Dyestuff + Organic Chemical Wastewater Treatment

INSTALLED EQUIPMENT MODULE			INSTALLED COST
-Thiosulfate Oxidation-			
Centrifugal Pump #1	Worksheet # E2-1		($ 5,181)
Centrifugal Pump #2	Worksheet # E2-2		($ 6,428)
-Ammonia Storage-			
Horiz. Tank #1	Worksheet # E2-3		($ 29,400)
-Phosphoric Acid Storage-			
Pump #1	Worksheet # E2-4		($ 125)
Vert. Tank #1	Worksheet # E2-5		($ 44,000)
-Acid Equalization-			
Centrifugal Pump #3	Worksheet # E2-6		($ 10,470)
-Limestone System-			
Screw Conveyor	Worksheet # E2-7		($ 5,300)
Vert. Tank #2	Worksheet # E2-8		($ 26,000)
Conveyor #1	Worksheet # E2-9		($ 6,923)
Conveyor #2	Worksheet # Same as #1		($ 6,923)
-Alkaline Equalization-			
Centrifugal Pump #4	Worksheet # E2-10		($ 16,956)
Centrifugal Pump #5	Worksheet # Same as #4		($ 16,956)
-Alkaline Oxidation-			
Pump #2	Worksheet # E2-11		($ 9,936)
Pump #3	Worksheet # E2-12		($ 2,250)
Horiz. Tank #2	Worksheet # E2-13		($ 22,000)
-Clarification-			
Thickener	Worksheet # E2-14		($ 240,000)
Centrifugal Pumps #6, #7	Worksheet # E2-15	2x	($ 22,022)
Centrifugal Pumps #8, #9	Worksheet # E2-16	2x	($ 17,898)
Vertical Tanks #3, #4, #5	Worksheet # E2-17	3x	($ 9,000)
Pump #4	Worksheet # E2-18		($ 9,320)
Pump #5	Worksheet # E2-19		($ 2,200)
Vert. Tank #6	Worksheet # E2-20		($ 14,798)

- -

SUBTOTAL INSTALLED EQUIPMENT MODULES COST ($ 582,006)

TABLE 19

WORK SHEET # E2-1 DATE: 3/16/73

ESTIMATION OF INSTALLED COST FOR A SINGLE INSTALLED EQUIPMENT MODULE (GENERALIZED WORK SHEET)

EQUIPMENT MODULE: Centrifugal Pump #1 (Pump to lagoon)
DATA SHEET NUMBERS: CP-1, CP-2
KEY COST PARAMETER: 3850 (GPM-FT)
CHARACTERISTIC INSTALLED BASE COST CURVE IF APPLICABLE (—)
1972 INSTALLED BASE COST: ($ 5,500)

ADJUSTMENTS:

Regional.................... F_R = 1 ; #1
Material .... F_M = 0 ; CS
Design .... F_D = 0.942 ; GSM50Z
.... = ;
.... = ;

OTHER PARAMETERS:

.... = — ;
.... = ;
.... = ;

CHARACTERISTIC ADJUSTMENT EQUATION:

1972 INSTALLED COST = (1972 Installed Base Cost) $(F_D + F_M) F_R$

1972 INSTALLED COST = ($5,500 (0.942 + 0) 1) = ($ 5,181)

INSTALLATION DATE: 1972
COST ESCALATION FACTOR: 1 ; —
INSTALLED COST = (1) x ($5,181) = ($ 5,181)
(installation date)

TABLE 20

WORK SHEET # E2-2 DATE: 3/16/73

ESTIMATION OF INSTALLED COST FOR A SINGLE INSTALLED EQUIPMENT MODULE
(GENERALIZED WORK SHEET)

EQUIPMENT MODULE: Centrifugal Pump #2 (Circulation pump)
DATA SHEET NUMBERS: CP-1, CP-2
KEY COST PARAMETER: 6300 (GPM-FT)
CHARACTERISTIC INSTALLED BASE COST CURVE IF APPLICABLE (—)
1972 INSTALLED BASE COST: ($ 6, 500)

ADJUSTMENTS:
Regional.................... F_R = 1 ; #1
Material.......... F_m = 0.047; 55304
Design.......... F_D = 0.942; ESMSOI
.... = ;
.... = ;

OTHER PARAMETERS:
.... = — ;
.... = ;
.... = ;

CHARACTERISTIC ADJUSTMENT EQUATION:

1972 INSTALLED COST = (1972 Installed Base Cost) $(F_D + F_M) F_R$

1972 INSTALLED COST = ($6,500(0.942+0.047) 1) = ($6,428)

INSTALLATION DATE: 1972
COST ESCALATION FACTOR: 1 ; —
INSTALLED COST = (1) x ($6, 428) = ($6,428)
(installation date)

TABLE 21

WORK SHEET #E2-3 DATE: 3/16/73

ESTIMATION OF INSTALLED COST FOR A SINGLE INSTALLED EQUIPMENT MODULE
(ADJUSTMENT FACTORS ARE MULTIPLIED)

EQUIPMENT MODULE: Horizontal Tank #1 (Ammonia storage)
DATA SHEET NUMBERS: HT-1, HT-2
KEY COST PARAMETER: 10,000 (gal.)
CHARACTERISTIC INSTALLED BASE COST CURVE IF APPLICABLE (—)
1972 INSTALLED BASE COST: ($28,000)

ADJUSTMENTS:

Regional............. F_R = 1 ; #1
Material..........x F_M = 1 ; CS
Pressure..........x F_P = 1.05 ; 250 psig
Temperature..........x F_T = 1 ; 95°F
__________..........x = ;
__________..........x = ;

ADJUSTMENT PRODUCT = 1.05

1972 INSTALLED COST = (1.05) ($28,000) = ($29,400)

INSTALLATION DATE: 1972

COST ESCALATION FACTOR: 1 ; —

INSTALLED COST = (1) x ($29,400) = ($29,400)
(Installation Date)

TABLE 22

WORK SHEET # E2-4 DATE: 3/16/73

ESTIMATION OF INSTALLED COST FOR A SINGLE INSTALLED EQUIPMENT MODULE
(ADJUSTMENT FACTORS ARE MULTIPLIED)

EQUIPMENT MODULE: Pump #1 (Acid metering)
DATA SHEET NUMBERS: P-1, P-2
KEY COST PARAMETER: 0.001 (HP)
CHARACTERISTIC INSTALLED BASE COST CURVE IF APPLICABLE ( )
1972 INSTALLED BASE COST: ($ Out of) Range of Data. From Alternate Source

ADJUSTMENTS:
Regional.............. F_R = ;
__________..........x = ;
__________..........x = ;
__________..........x = ;
__________..........x = ;
__________..........x = ;

ADJUSTMENT PRODUCT = ______

1972 INSTALLED COST = ( ) ($) = ($)

INSTALLATION DATE: ________

COST ESCALATION FACTOR: ________; ________

INSTALLED COST = ( ) x ( ) = ($125)
(Installation Date)

TABLE 23

WORK SHEET #E2-5 DATE: 3/16/73

ESTIMATION OF INSTALLED COST FOR A SINGLE INSTALLED EQUIPMENT MODULE (ADJUSTMENT FACTORS ARE MULTIPLIED)

EQUIPMENT MODULE: Vertical Tank #1 (Phosphoric acid storage)

DATA SHEET NUMBERS: VT-1, VT-2

KEY COST PARAMETER: 4500 (gal.)

CHARACTERISTIC INSTALLED BASE COST CURVE IF APPLICABLE (A, cyl.)

1972 INSTALLED BASE COST: ($ 44,000)

ADJUSTMENTS:

Regional.............. F_R = 1 ; #1
Design..........x F_D = 1 ; 50 psig cyl.
Material..........x F_M = 1 ; CS
Temperature..........x F_T = 1 ; 650°F
..........x = ;
..........x = ;

ADJUSTMENT PRODUCT = 1

1972 INSTALLED COST = (1) ($ 44,000) = ($ 44,000)

INSTALLATION DATE: 1972

COST ESCALATION FACTOR: 1 ; —

INSTALLED COST = (1) x ($ 44,000) = ($ 44,000)
(Installation Date)

TABLE 24

WORK SHEET # E2-6 DATE: 3/16/73

ESTIMATION OF INSTALLED COST FOR A SINGLE INSTALLED EQUIPMENT MODULE
(GENERALIZED WORK SHEET)

EQUIPMENT MODULE: Centrifugal Pump # 3 (Neutralization lagoon)
DATA SHEET NUMBERS: CP-1, CP-2
KEY COST PARAMETER: 33,750 (GPM-FT)
CHARACTERISTIC INSTALLED BASE COST CURVE IF APPLICABLE (—)
1972 INSTALLED BASE COST: ($10,000)

ADJUSTMENTS:

Regional.................... F_R = 1 ; #1
Material .... F_M = 0.047; SS304
Design .... F_D = 1 ; AVS
__________ .... = ;
__________ .... = ;

OTHER PARAMETERS:

__________ .... = — ;
__________ .... = ;
__________ .... = ;

CHARACTERISTIC ADJUSTMENT EQUATION:

1972 INSTALLED COST = (1972 Installed Base Cost) $(F_D + F_M) F_R$.

1972 INSTALLED COST = ($10,000(1. + 0.047) 1) = ($10,470)

INSTALLATION DATE: 1972
COST ESCALATION FACTOR: 1 ; —
INSTALLED COST = (1) x ($10,470) = ($10,470)
(installation date)

TABLE 25

WORK SHEET # E2-7 DATE: 3/16/73

ESTIMATION OF INSTALLED COST FOR A SINGLE INSTALLED EQUIPMENT MODULE (REGIONAL ADJUSTMENT FACTOR ONLY)

EQUIPMENT MODULE: Screw Conveyor (Limestone)

DATA SHEET NUMBERS: CO-1, CO-2

KEY COST PARAMETER: 10 (ft) ; 6 in.

1972 INSTALLED BASE COST:........(Out of Range of Data. From Alternate Source

ADJUSTMENT:

Regional······F_R = ____;#____

1972 INSTALLED COST =(   )x($)=($)

INSTALLATION DATE:__________

COST ESCALATION FACTOR:______________;___

INSTALLED COST = (   ) x ($) = ($ 5,300)
(Installation Date)

TABLE 26

WORK SHEET # EX-8 DATE: 3/16/73

ESTIMATION OF INSTALLED COST FOR A SINGLE INSTALLED EQUIPMENT MODULE
(ADJUSTMENT FACTORS ARE MULTIPLIED)

EQUIPMENT MODULE: Vertical Tank #2 (Silo storage)
DATA SHEET NUMBERS: VT-1, VT-2
KEY COST PARAMETER: 30,500 (gal.)
CHARACTERISTIC INSTALLED BASE COST CURVE IF APPLICABLE (C, cone)
1972 INSTALLED BASE COST: ($ Out of Range of Data.
From Alternate Source

ADJUSTMENTS:
Regional.............. F_R = ;
__________..........x = ;
__________..........x = ;
__________..........x = ;
__________..........x = ;
__________..........x = ;

ADJUSTMENT PRODUCT = ______

1972 INSTALLED COST = ( ) ($) = ($)

INSTALLATION DATE: ________

COST ESCALATION FACTOR: __________; ________

INSTALLED COST = ( ) x ( ) = ($26,000)
(Installation Date)

TABLE 27

WORK SHEET # E2-9 DATE: 3/16/73

ESTIMATION OF INSTALLED COST FOR A SINGLE INSTALLED EQUIPMENT MODULE
(ADJUSTMENT FACTORS ARE MULTIPLIED)

EQUIPMENT MODULE: Conveyor #1 (Unloading)
DATA SHEET NUMBERS: CO-7, CO-8
KEY COST PARAMETER: 100 (ft.)
CHARACTERISTIC INSTALLED BASE COST CURVE IF APPLICABLE (—)
1972 INSTALLED BASE COST: ($ 7,000)

ADJUSTMENTS:
Regional.............. F_R = 1 ; #1
Design ....x F_D =0.885; 3 in.
Flow ....x F_F =1.12; 15 TPH
__________..........x = ;
__________..........x = ;
__________..........x = ;

ADJUSTMENT PRODUCT = 0.989

1972 INSTALLED COST = (0.989) ($ 7,000) = ($ 6,923)

INSTALLATION DATE: 1972

COST ESCALATION FACTOR: 1 ; —

INSTALLED COST = (1) x ($6,923) = ($ 6,923)
(Installation Date)

TABLE 28

WORK SHEET # E2-10 DATE: 3/16/73

ESTIMATION OF INSTALLED COST FOR A SINGLE INSTALLED EQUIPMENT MODULE
(GENERALIZED WORK SHEET)

EQUIPMENT MODULE: Centrifugal Pump #4 (Equalization lagoon)
DATA SHEET NUMBERS: CP-1, CP-2
KEY COST PARAMETER: 103,400 (GPM·FT)
CHARACTERISTIC INSTALLED BASE COST CURVE IF APPLICABLE (—)
1972 INSTALLED BASE COST: ($18,000)

ADJUSTMENTS:
Regional.................... F_R = 1 ; #1
Material .... F_m = 0 ; CS
Design .... F_D = 0.942; GSMSOI
.... = ;
.... = ;

OTHER PARAMETERS:
.... = — ;
.... = ;
.... = ;

CHARACTERISTIC ADJUSTMENT EQUATION:

1972 INSTALLED COST = (1972 Installed Base Cost) $(F_D+F_m)F_R$

1972 INSTALLED COST = ($18,000(0.942+0.)1) = ($16,956)

INSTALLATION DATE: 1972
COST ESCALATION FACTOR: 1 ; —
INSTALLED COST = (1) x ($16,956) = ($16,956)
(installation date)

TABLE 29

WORK SHEET # E2-11 DATE: 3/16/73

ESTIMATION OF INSTALLED COST FOR A SINGLE INSTALLED EQUIPMENT MODULE
(ADJUSTMENT FACTORS ARE MULTIPLIED)

EQUIPMENT MODULE: Pump #2 (Limestone slurry)
DATA SHEET NUMBERS: P-1, P-2
KEY COST PARAMETER: 17 (GPM)
CHARACTERISTIC INSTALLED BASE COST CURVE IF APPLICABLE (8, slurry)
1972 INSTALLED BASE COST: ($ 9,000)

ADJUSTMENTS:
Regional............. F_R = 1 ; #1
Design ....x F_D = 1.104 ; slurry
__________..........x = ;
__________..........x = ;
__________..........x = ;
__________..........x = ;

ADJUSTMENT PRODUCT = 1.104

1972 INSTALLED COST = (1.104) ($ 9,000) = ($ 9,936)

INSTALLATION DATE: 1972

COST ESCALATION FACTOR: 1 ; —

INSTALLED COST = (1) x ($ 9,936) = ($ 9,936)
(Installation Date)

TABLE 30

WORK SHEET # E2-12 DATE: 3/16/73

ESTIMATION OF INSTALLED COST FOR A SINGLE INSTALLED EQUIPMENT MODULE
(ADJUSTMENT FACTORS ARE MULTIPLIED)

EQUIPMENT MODULE: Pump #3 (Caustic pump)
DATA SHEET NUMBERS: P-1, P-2
KEY COST PARAMETER: 2 (GPM)
CHARACTERISTIC INSTALLED BASE COST CURVE IF APPLICABLE (B, diaph.)
1972 INSTALLED BASE COST: ($ Out of Range of Data
From Alternate Source

ADJUSTMENTS:
Regional.............. F_R = ;
__________..........x = ;
__________..........x = ;
__________..........x = ;
__________..........x = ;
__________..........x = ;

ADJUSTMENT PRODUCT = ______

1972 INSTALLED COST = ( ) ($) = ($)

INSTALLATION DATE: ________

COST ESCALATION FACTOR: ________;________

INSTALLED COST = ( ) x ( ) = ($2,250)
(Installation Date)

TABLE 31

WORK SHEET # E2-13 DATE: 3/16/73

ESTIMATION OF INSTALLED COST FOR A SINGLE INSTALLED EQUIPMENT MODULE
(ADJUSTMENT FACTORS ARE MULTIPLIED)

EQUIPMENT MODULE: Horiz. Tank #2 (Caustic soda tank)
DATA SHEET NUMBERS: HT-1, HT-2
KEY COST PARAMETER: 6000 (gal.)
CHARACTERISTIC INSTALLED BASE COST CURVE IF APPLICABLE (—)
1972 INSTALLED BASE COST: ($22,000)

ADJUSTMENTS:
Regional............. F_R = 1 ; #1
Temperature..........x F_T = 1 ; 650°F
Pressure ....x F_P = 1 ; 1atm.
Material ....x F_m = 1 ; CS
__________..........x = ;
__________..........x = ;

ADJUSTMENT PRODUCT = 1

1972 INSTALLED COST = (1) ($22,000) = ($22,000)

INSTALLATION DATE: 1972

COST ESCALATION FACTOR: 1 ; —

INSTALLED COST = (1) x ($22,000) = ($22,000)
(Installation Date)

TABLE 32

WORK SHEET # E2-14 DATE: 3/16/73

ESTIMATION OF INSTALLED COST FOR A SINGLE INSTALLED EQUIPMENT MODULE
(REGIONAL ADJUSTMENT FACTOR ONLY)

EQUIPMENT MODULE: Thickener

DATA SHEET NUMBERS: T-1, T-2

KEY COST PARAMETER: 100 (ft.)

1972 INSTALLED BASE COST:........(240,000)

ADJUSTMENT:

Regional......F_R = 1 ;# 1

1972 INSTALLED COST =(1)x($240,000)=($240,000)

INSTALLATION DATE: 1972

COST ESCALATION FACTOR: 1 ; —

INSTALLED COST = (1) x ($240,000) = ($240,000)
(Installation Date)

TABLE 33

WORK SHEET # E2-15 DATE: 3/16/73

ESTIMATION OF INSTALLED COST FOR A SINGLE INSTALLED EQUIPMENT MODULE
(GENERALIZED WORK SHEET)

EQUIPMENT MODULE: Centrifugal Pump #6 (Mixed liquor pump)
DATA SHEET NUMBERS: CP-1, CP-2
KEY COST PARAMETER: 157,500 (GPM-FT)
CHARACTERISTIC INSTALLED BASE COST CURVE IF APPLICABLE (—)
1972 INSTALLED BASE COST: ($22,000)

ADJUSTMENTS:
Regional.................... F_R = 1 ; #1
Material .... F_m = 0 ; CS
Design .... F_D = 1.001; MS
.... = ;
.... = ;

OTHER PARAMETERS:
.... = — ;
.... = ;
.... = ;

CHARACTERISTIC ADJUSTMENT EQUATION:

1972 INSTALLED COST = (1972 Installed Base Cost) $(F_D + F_m) F_R$

1972 INSTALLED COST = ($22,000 (1.001 + 0.) 1.) = ($22,022)

INSTALLATION DATE: 1972
COST ESCALATION FACTOR: 1 ; —
INSTALLED COST = (1) x ($22,022) = ($22,022)
(installation date)

TABLE 34

WORK SHEET # E2-16 DATE: 3/16/73

ESTIMATION OF INSTALLED COST FOR A SINGLE INSTALLED EQUIPMENT MODULE
(GENERALIZED WORK SHEET)

EQUIPMENT MODULE: Centrifugal Pump #8 (Sludge pump)
DATA SHEET NUMBERS: CP-1, CP-2
KEY COST PARAMETER: 115,500 (GPM-FT)
CHARACTERISTIC INSTALLED BASE COST CURVE IF APPLICABLE (—)
1972 INSTALLED BASE COST: ($19,000)

ADJUSTMENTS:
Regional.................... F_R = 1 ; #1
Material .... F_M = 0 ; CS
Design .... F_D = 0.942 ; GSMSOI
__________ .... = ;
__________ .... = ;

OTHER PARAMETERS:
__________ .... = — ;
__________ .... = ;
__________ .... = ;

CHARACTERISTIC ADJUSTMENT EQUATION:

1972 INSTALLED COST = (1972 Installed Base Cost) $(F_D + F_M) F_R$

1972 INSTALLED COST = ($19,000 (0.942 + 0.) 1.) = ($17,898)

INSTALLATION DATE: 1972
COST ESCALATION FACTOR: 1 ; —
INSTALLED COST = (1) x ($17,898) = ($17,898)
(installation date)

TABLE 35

WORK SHEET # E2-17   DATE: 3/16/73

ESTIMATION OF INSTALLED COST FOR A SINGLE INSTALLED EQUIPMENT MODULE (ADJUSTMENT FACTORS ARE MULTIPLIED)

EQUIPMENT MODULE: Vertical Tank #3 (Flocculation tank)
DATA SHEET NUMBERS: VT-1, VT-2
KEY COST PARAMETER: 3000 (gal.)
CHARACTERISTIC INSTALLED BASE COST CURVE IF APPLICABLE (C, open)
1972 INSTALLED BASE COST: ($ Out of Range of Data.
From Alternate Source

ADJUSTMENTS:
Regional............. F_R = ;
__________..........x = ;
__________..........x = ;
__________..........x = ;
__________..........x = ;
__________..........x = ;

ADJUSTMENT PRODUCT = ______

1972 INSTALLED COST = ( ) ($) = ($)

INSTALLATION DATE: __________

COST ESCALATION FACTOR: __________; __________

INSTALLED COST = ( ) x ( ) = ($ 9,000)
(Installation Date)

TABLE 36

WORK SHEET # E2-18 DATE: 3/16/73

ESTIMATION OF INSTALLED COST FOR A SINGLE INSTALLED EQUIPMENT MODULE
(ADJUSTMENT FACTORS ARE MULTIPLIED)

EQUIPMENT MODULE: Pump #4 (Thiodilution)
DATA SHEET NUMBERS: P-1, P-2
KEY COST PARAMETER: 375 (GPM)
CHARACTERISTIC INSTALLED BASE COST CURVE IF APPLICABLE (B)
1972 INSTALLED BASE COST: ($ 20,000) extrapolation

ADJUSTMENTS:
Regional .... F_R = 1 ; #1
Design .... x F_D = 0.466; Rotary
__________ .... x = ;
__________ .... x = ;
__________ .... x = ;
__________ .... x = ;

ADJUSTMENT PRODUCT = 0.466

1972 INSTALLED COST = (0.466) ($20,000) = ($ 9,320)

INSTALLATION DATE: 1972

COST ESCALATION FACTOR: 1 ; —

INSTALLED COST = (1) x ($9,320) = ($ 9,320)
(Installation Date)

TABLE 37

WORK SHEET #E2-19 DATE: 3/16/73

ESTIMATION OF INSTALLED COST FOR A SINGLE INSTALLED EQUIPMENT MODULE
(ADJUSTMENT FACTORS ARE MULTIPLIED)

EQUIPMENT MODULE: Pump #5 (Metering pump)
DATA SHEET NUMBERS: P-1, P-2
KEY COST PARAMETER: 0.4 (GPM)
CHARACTERISTIC INSTALLED BASE COST CURVE IF APPLICABLE (B, diaph.)
1972 INSTALLED BASE COST: ($ Out of Range of Data
From Alternate Source

ADJUSTMENTS:

Regional............. F_R = ;
__________..........x = ;
__________..........x = ;
__________..........x = ;
__________..........x = ;
__________..........x = ;

ADJUSTMENT PRODUCT = ______

1972 INSTALLED COST = ( ) ($) = ($)

INSTALLATION DATE: ________

COST ESCALATION FACTOR: ________; ________

INSTALLED COST = ( ) x ( ) = ($2,200)
(Installation Date)

TABLE 38

WORK SHEET # E2-20 DATE: 3/16/73

ESTIMATION OF INSTALLED COST FOR A SINGLE INSTALLED EQUIPMENT MODULE
(ADJUSTMENT FACTORS ARE MULTIPLIED)

EQUIPMENT MODULE: Vertical Tank #6 (Alum storage)
DATA SHEET NUMBERS: VT-1, VT-2
KEY COST PARAMETER: 6000 (gal)
CHARACTERISTIC INSTALLED BASE COST CURVE IF APPLICABLE (C, conical)
1972 INSTALLED BASE COST: ($ Out of Range of Data.
From Alternate Source.

ADJUSTMENTS:
Regional............. F_R = ;
___________..........x = ;
___________..........x = ;
___________..........x = ;
___________..........x = ;
___________..........x = ;

ADJUSTMENT PRODUCT = _______

1972 INSTALLED COST = ( ) ($) = ($)

INSTALLATION DATE: _________

COST ESCALATION FACTOR: __________; ________

INSTALLED COST = ( ) x ( ) = ($14,798)
(Installation Date)

TABLE 39

WORKSHEET # E2-22 DATE 3/16/73

PROCESS Dyestuff + Organic Chemical/Wastewater Treatment

SPECIAL ITEMS	INSTALLED COST
-Thiosulfate Oxidation-	
Excavation + Reseeding	($ 13,000)
Piping to Lagoon	($ 25,000)
Auxiliary Piping	($ 12,500)
Piping to Acid Neutralizer	($ 9,000)
-Acid Equalization-	
Piping	($ 8,900)
-Settling Basin-	
Excavation	($ 32,900)
-Alkaline Oxidation-	
Lagoon Modifications	($ 5,600)
Lime Slaking Basin Modifications	($ 2,800)
Variable Drive Pump #2	($ 850)
Variable Drive Pump #3	($ 850)
-Control Room and Laboratory-	
Subcontracted Cost	($ 17,550)
-Chlorination-	
Chlorinator System	($ 22,200)
Contact Basin	($ 40,300)
-Final Settling-	
Basin	($ 11,100)
-Post Aeration Basin-	
Excavation	($ 5,600)
Aerator	($ 3,900)
	($)
	($)
	($)
	($)

SUBTOTAL SPECIAL ITEMS INSTALLED COST ($ 212,050)

TABLE 40

WORK SHEET # E2-23 DATE: 3/16/73

ESTIMATION OF THE INSTALLED PROCESS COST

PROCESS Dyestuff + Organic Chemical Wastewater Treatment

INSTALLED EQUIPMENT MODULE	INSTALLED COST
Subtotal ;Worksheet #E2-21	($ 582,006)
;Worksheet #	($)
;Worksheet #	($)
;Worksheet #	($)
;Worksheet #	($)

TOTAL INSTALLED EQUIPMENT MODULES COST =($582,006)

SPECIAL ITEMS	INSTALLED COST
Subtotal; Worksheet #E2-22	($ 212,050)
	($)
	($)
	($)
	($)

TOTAL SPECIAL ITEMS INSTALLED COST =($213050)

BARE PLANT COST =($794,056)

PERCENT CONTINGENCIES OF BARE PLANT COST 10

CONTINGENCIES = (10 /100)x($794,056) =($79,406)

CONTRACTORS FEE AS A PERCENT OF BARE PLANT COST 3

CONTRACTORS FEE = (3 /100)x($794,056) =($23,821)

COST OF LAND =($ —)

TOTAL INSTALLED COST =($897,283)

using the Data Manual, are summarized. Worksheets #E2-1 to E2-20, given in Table 19 to 38, list the parameters for each as well as the procedure used to determine the individual installed equipment module costs of each. For a few of the modules, such as shown on worksheets #E2-4 and E2-8, the Data Manual did not span the desired range and the installed costs had to be estimated in an alternative fashion. The user should be aware that this may occassionally be the case and should exercise extreme caution in extrapolating beyond the range given in the Data Manual in order to avoid unreasonable estimates because of marked design or construction changes. As shown in Table 18, the total installed cost of the itemized installed equipment modules is estimated to be $582,006.

In Worksheet #E2-22 given in Table 39, the 1972 installed costs of other necessary items not estimated using the Data Manual are given. The total of these costs is $212,050.

In worksheet #E2-23 given in Table 40 the installed equipment module costs and the cost of the special items are added, a 10% contingency assumed, and a 3% contractor's fee added to yield a total estimate of the installed process of $897,000. For the items considered here, the installed cost of $897,000 is within 5% of the contractor's definitive estimate in EPA Grant #12090 GLZ(Southern Dyestuff Company).

SECTION X

ESTIMATION OF ANNUAL PROCESS COST

The pertinent elements contributing to the annual cost of a process have been discussed in detail in Section IV: POLLUTION CONTROL ECONOMICS. In this section, suggested worksheets for the estimation of annual process cost are presented, their use illustrated by example, and the elements of annual cost reviewed to indicate the information which must be available to the user before an estimate can be made.

The first part of the worksheet, given in Table 41, details the contributions of annual fixed charges to the annual cost and includes:

1. The annual fixed charge for depreciable capital, referred to as the annual sinking fund payment,
2. The annual credit for salvage value,
3. The annual fixed charge for lump sum royalties, licenses, and fees,
4. The annual charge for bond interest,
5. The annual charge for rent,
6. The annual charge for insurance, and
7. The annual charge for property taxes.

The second portion of the worksheet details the estimation of the annual direct operating costs and includes the annual cost of:

1. Raw materials,
2. Utilities,
3. Maintenance,
4. Operating labor, supervisors, and foremen
5. Contractual services,

TABLE 41

PART 1 of 4

WORKSHEET #______________ DATE:__________

ESTIMATION OF ANNUAL PROCESS COST

1. PROCESS ____
2. INSTALLED PROCESS COST (Excluding Working Capital) =($) Worksheet #________
3. LAND COST =($)(-)
4. SALVAGE VALUE =($)(-)
5. DEPRECIABLE CAPITAL INVESTMENT= ($)
6. USEFUL LIFETIME _____ YEARS
7. SINKING FUND INTEREST RATE _____%/yr.
8. SINKING FUND FACTOR ( )
9. ANNUAL SINKING FUND PAYMENT ( )x( ) = ($)
10. SALVAGE VALUE ($)
11. FIXED CHARGE FOR SALVAGE VALUE ( )x( ) = -($)
12. ROYALTIES, FEES, ETC. ($)
13. FIXED CHARGE FOR ROYALTIES, FEES, ETC. ( )x( ) = ($)
14. AMOUNT OF BOND ISSUE ($)
15. ANNUAL BOND INTEREST RATE______ %/yr.
16. ANNUAL BOND INTEREST = (/100)x($) = ($)
17. ANNUAL RENT = ($)
18. INVESTMENT INSURED ($)
19. ANNUAL INSURANCE RATE_____%/yr.
20. ANNUAL INSURANCE = (/100)x($) = ($)
21. INVESTMENT PROPERTY TAXED ($)
22. ANNUAL PROPERTY TAX RATE __________ %/yr.
23. ANNUAL PROPERTY TAX = (/100)x($) = ($)
24. ANNUAL FIXED CHARGES ($)

TABLE 41
PART 2 of 4

RAW MATERIAL	QUANTITY PER YEAR		UNIT PRICE		COST PER YEAR
______	( )	x	($)	=	($)
______	( )	x	($)	=	($)
______	( )	x	($)	=	($)
______	( )	x	($)	=	($)
______	( )	x	($)	=	($)
______	( )	x	($)	=	($)
______	( )	x	($)	=	($)

DIRECT OPERATING COST FOR RAW MATERIALS = ($)

UTILITY	QUANTITY PER YEAR		UNIT PRICE		COST PER YEAR
______	( )	x	($)	=	($)
______	( )	x	($)	=	($)
______	( )	x	($)	=	($)
______	( )	x	($)	=	($)
______	( )	x	($)	=	($)

DIRECT OPERATING COST FOR UTILITIES = ($)

ANNUAL MAINTENANCE COST = ($)

ANNUAL OPERATOR COST = ($)

SUPERVISORS REQUIRED PER SHIFT ( )

SHIFTS PER DAY ( )

ANNUAL SUPERVISOR SALARY + BURDEN ( )

ANNAUL SUPERVISOR COST = ( ) x ( ) x ( ) = ($)

FOREMEN REQUIRED PER SHIFT ( )

SHIFTS PER DAY ( )

ANNUAL FOREMAN SALARY + BURDEN ( )

ANNUAL FOREMEN COST = ( ) x ( ) x ( ) = ($)

CONTRACTUAL SERVICE COST

______ ( )
______ ( )
______ ( )
______ ( )
______ ( )

ANNUAL COST CONTRACTUAL SERVICES AND MISCELLANEOUS ITEMS = ($)

ANNUAL COST RESIDUAL WASTE DISPOSAL = ($)

ANNUAL COST OF ROYALTIES, FEES, ETC. = ($)

ANNUAL DIRECT OPERATING COST = ($)

TABLE 41
PART 3 of 4

POSITION	NUMBER		SALARY + BURDEN		COST PER YEAR
	( )	x	($)	=	($)
	( )	x	($)	=	($)
	( )	x	($)	=	($)
	( )	x	($)	=	($)
	( )	x	($)	=	($)
	( )	x	($)	=	($)
	( )	x	($)	=	($)
	( )	x	($)	=	($)
	( )	x	($)	=	($)
	( )	x	($)	=	($)

ANNUAL COST ADMINISTRATION AND STAFF = ($)

SPECIAL ITEM	
	($)
	($)
	($)
	($)
	($)

ANNUAL COST SPECIAL ITEMS = ($)

ANNUAL INDIRECT OPERATING COSTS = ($)

SUMMARY

ANNUAL FIXED CHARGES = ($)

ANNUAL DIRECT OPERATING COSTS = ($)

ANNUAL INDIRECT OPERATING COSTS = ($)

TOTAL ANNUAL COST EXCLUDING TAX CREDIT = ($)

TABLE 41
PART 4 of 4

ANNUAL TAX CREDIT:

TAX DEPRECIATION METHOD________________________________

DEPRECIATION LIFETIME FOR TAX PURPOSES ____________________

DEPRECIABLE CAPITAL INVESTMENT .... = ($)

INCOME TAX RATE ______________________________

YEAR	DEPRECIATION RATE (%/year)				ANNUAL TAX CREDIT
____	(/ 100)	x ( )	x	($)	= ($)
____	(/ 100)	x ( )	x	($)	= ($)
____	(/ 100)	x ( )	x	($)	= ($)
____	(/ 100)	x ( )	x	($)	= ($)
____	(/ 100)	x ( )	x	($)	= ($)
____	(/ 100)	x ( )	x	($)	= ($)
____	(/ 100)	x ( )	x	($)	= ($)
____	(/ 100)	x ( )	x	($)	= ($)
____	(/ 100)	x ( )	x	($)	= ($)
____	(/ 100)	x ( )	x	($)	= ($)
____	(/ 100)	x ( )	x	($)	= ($)
____	(/ 100)	x ( )	x	($)	= ($)
____	(/ 100)	x ( )	x	($)	= ($)
____	(/ 100)	x ( )	x	($)	= ($)
____	(/ 100)	x ( )	x	($)	= ($)
____	(/ 100)	x ( )	x	($)	= ($)
					($)

DISCOUNTED TAX CREDIT:

TAX DEPRECIATION METHOD____________________

DEPRECIATION LIFETIME FOR TAX PURPOSES__________

INTEREST RATE __________% ________

DEPRECIABLE CAPITAL INVESTMENT = ($)

DISCOUNTED TAX CREDIT RATE ( )

INCOME TAX RATE (.)

DISCOUNTED TAX CREDIT = ( ) x ( ) x ($) = ($)

6. Residual waste disposal, and

7. Royalties, licenses, fees, etc. which are operation dependent.

The user should adopt a flexible attitude towards the interpretation of these items so as not to preclude any costs which are closely related to operation. Thus laboratory equipment and supplies, not included in the installed process cost, may need be considered with the items of a more permanent nature being amortized over their useful lifetime to determine their annual cost. Similarly, operating chemicals and supplies should be included although they may not conform to one's general concept of raw materials. If marked changes in production or processing rate are expected during the lifetime of the process, some of the pertinent operating costs may have to be evaluated each year.

Supplemental worksheets, such as given in Tables 42 to 46, may be used if the particular items of the annual direct operating costs are numerous. They are particularly useful for estimating maintenance and operator requirements by the detailing of individual installed equipment module requirements using the estimates for each presented in the Data Manual.

The next section of the worksheet deals with the estimation of the annual indirect operating costs including:

1. Administrative personnel and staff, and

2. Special items such as medical facilities, office supplies, safety and protection costs, communications, distribution and marketing expenses, research and development costs, etc. which may be applicable in individual cases.

The total annual cost excluding the tax credit is then calculated as the sum of the annual fixed charges, the annual direct operating costs, and the annual indirect operating costs.

TABLE 42

WORKSHEET # ____________ DATE: ____________

EVALUATION OF ANNUAL RAW MATERIAL COSTS

PROCESS ____

RAW MATERIAL	QUANTITY PER YEAR		UNIT PRICE		COST PER YEAR
____________	( )	x	($)	=	($)
____________	( )	x	($)	=	($)
____________	( )		($)	=	($)
____________	( )		($)	=	($)
____________	( )		($)	=	($)
____________	( )		($)	=	($)
____________	( )		($)	=	($)
____________	( )		($)	=	($)
____________	( )		($)	=	($)
____________	( )		($)	=	($)
____________	( )		($)	=	($)
____________	( )		($)	=	($)
____________	( )		($)	=	($)
____________	( )		($)	=	($)
____________	( )		($)	=	($)
____________	( )		($)	=	($)
____________	( )		($)	=	($)
____________	( )		($)	=	($)
____________	( )		($)	=	($)

- -

TOTAL = ($)

TABLE 43

WORKSHEET #____________________ DATE________________

EVALUATION OF ANNUAL UTILITY COSTS

PROCESS____

UTILITY	QUANTITY PER YEAR		UNIT PRICE		COST PER YEAR
________________	( )	x	($)	=	($)
________________	( )	x	($)	=	($)
________________	( )	x	($)	=	($)
________________	( )	x	($)	=	($)
________________	( )	x	($)	=	($)
________________	( )	x	($)	=	($)
________________	( )	x	($)	=	($)
________________	( )	x	($)	=	($)
________________	( )	x	($)	=	($)
________________	( )	x	($)	=	($)
________________	( )	x	($)	=	($)
________________	( )	x	($)	=	($)
________________	( )	x	($)	=	($)
________________	( )	x	($)	=	($)
________________	( )	x	($)	=	($)
________________	( )	x	($)	=	($)
________________	( )	x	($)	=	($)
________________	( )	x	($)	=	($)
________________	( )	x	($)	=	($)
________________	( )	x	($)	=	($)

- -

TOTAL = ($)

TABLE 44

WORKSHEET #________________ DATE________________

EVALUATION OF ANNUAL MAINTENANCE COSTS

PROCESS____

INSTALLED EQUIPMENT MODULE	INSTALLED COST		FRAC. MAINTENANCE PER YEAR		COST PER YEAR
____________	($)	x	( )	=	($)
____________	($)	x	( )	=	($)
____________	($)	x	( )	=	($)
____________	($)	x	( )	=	($)
____________	($)	x	( )	=	($)
____________	($)	x	( )	=	($)
____________	($)	x	( )	=	($)
____________	($)	x	( )	=	($)
____________	($)	x	( )	=	($)
____________	($)	x	( )	=	($)
____________	($)	x	( )	=	($)
____________	($)	x	( )	=	($)
____________	($)	x	( )	=	($)
____________	($)	x	( )	=	($)
____________	($)	x	( )	=	($)
____________	($)	x	( )	=	($)
____________	($)	x	( )	=	($)
		TOTAL		=	($)

TABLE 45

WORKSHEET # ______ DATE:____________

EVALUATION OF MANUAL OPERATOR REQUIREMENTS

INSTALLED EQUIPMENT MODULE	OPERATORS PER SHIFT		SHIFTS PER DAY		OPERATOR REQUIREMENT PER DAY
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
			TOTAL	=	( )

TABLE 46

WORKSHEET #____________________ DATE:_____________

EVALUATION OF ANNUAL CONTRACTURAL SERVICES AND MISCELLANEOUS ITEMS

PROCESS____

ITEM	COST PER YEAR
________________________________	($)
________________________________	($)
________________________________	($)
________________________________	($)
________________________________	($)
________________________________	($)
________________________________	($)
________________________________	($)
________________________________	($)
TOTAL =	($)

The next section of the worksheet details the calculation of the annual tax credit for each year of the lifetime of the process. For the convenience of the user the depreciation rate is given in Appendix C as a function of the method of depreciation chosen and the depreciation lifetime. For all but straight line depreciation the annual amount will vary with time.

The calculation of the discounted tax credit (the present value of all annual tax credits) is the last entry in the worksheet. For the convenience of the user, the discounted tax credit rate is given in Appendix D as a function of the depreciation lifetime. Only for an interest rate of 0%/year will the arithmetic sum of the annual tax credits be equal to the discounted tax credit.

EXAMPLE

To illustrate the use of the worksheets for estimating the annual cost of a process, the dyestuff and organic chemical wastewater treatment process previously used as an example will be chosen. Arbitrary values will be selected and duly noted for information which can be highly location dependent.

Consider first the steps involved in estimating the annual fixed charges as indicated in Worksheet #E2-24, Table 47.

1. The process under consideration, Dyestuff and Organic Chemical Wastewater Treatment, is first noted.

2. The installed process cost, exclusive of working capital, is then recorded. For the example, it is $897,300 as determined using Worksheet #E2-23, Table 40.

3. The cost of land which entered into the determination of the installed process cost is noted. For the example this cost was assumed to be zero.

4. The expected salvage value of the process after its useful lifetime is entered next. For purposes of the preliminary estimate a value of zero is assumed.

TABLE 47
PART 1 of 4

WORKSHEET # E2-24 DATE: 3/16/73

ESTIMATION OF ANNUAL PROCESS COST

1. PROCESS Dyestuff + Organic Chemical Wastewater Treatment
2. INSTALLED PROCESS COST (Excluding Working Capital) =($897,300) Worksheet # E2-23
3. LAND COST =($ —)(-)
4. SALVAGE VALUE =($ —)(-)
5. DEPRECIABLE CAPITAL INVESTMENT= ($897,300)
6. USEFUL LIFETIME 15 YEARS
7. SINKING FUND INTEREST RATE 6 %/yr.
8. SINKING FUND FACTOR (0.04296)
9. ANNUAL SINKING FUND PAYMENT (0.04296)x(897,300) = ($38,550)
10. SALVAGE VALUE ($ —)
11. FIXED CHARGE FOR SALVAGE VALUE (—)x(0.04296) = -($ —)
12. ROYALTIES, FEES, ETC. ($ —)
13. FIXED CHARGE FOR ROYALTIES, FEES, ETC. (—)x( ) = ($ —)
14. AMOUNT OF BOND ISSUE ($ —)
15. ANNUAL BOND INTEREST RATE ____ %/yr.
16. ANNUAL BOND INTEREST = (/100)x($ —) = ($ —)
17. ANNUAL RENT = ($ —)
18. INVESTMENT INSURED ($897,300)
19. ANNUAL INSURANCE RATE 0.5 %/yr.
20. ANNUAL INSURANCE = (0.5 /100)x($897,300) = ($ 4,487)
21. INVESTMENT PROPERTY TAXED ($897,300)
22. ANNUAL PROPERTY TAX RATE 2 %/yr.
23. ANNUAL PROPERTY TAX = (2 /100)x($897,300) = ($17,946)
24. ANNUAL FIXED CHARGES ($60,983)

TABLE 47 (cont.)
PART 2 of 4

RAW MATERIAL	QUANTITY PER YEAR		UNIT PRICE		COST PER YEAR
Subtotal	( )	x	($)	=	($ 99,315) ; Worksheet E2-25
	( )	x	($)	=	($)
	( )	x	($)	=	($)
	( )	x	($)	=	($)
	( )	x	($)	=	($)
	( )	x	($)	=	($)
	( )	x	($)	=	($)

DIRECT OPERATING COST FOR RAW MATERIALS = ($99,315)

UTILITY	QUANTITY PER YEAR		UNIT PRICE		COST PER YEAR
Electricity	(2,200,000 kw-hr)	x	($0.015/kw-hr)	=	($ 33,000)
	( )	x	($)	=	($)
	( )	x	($)	=	($)
	( )	x	($)	=	($)
	( )	x	($)	=	($)

DIRECT OPERATING COST FOR UTILITIES = ($ 33,000)

ANNUAL MAINTENANCE COST ; Worksheet E2-26 = ($ 17,100)

ANNUAL OPERATOR COST = ($19,800)

SUPERVISORS REQUIRED PER SHIFT (—)

SHIFTS PER DAY ( )

ANNUAL SUPERVISOR SALARY + BURDEN ( )

ANNAUL SUPERVISOR COST = ( ) x ( ) x ( ) = ($ —)

FOREMEN REQUIRED PER SHIFT (—)

SHIFTS PER DAY ( )

ANNUAL FOREMAN SALARY + BURDEN ( )

ANNUAL FOREMEN COST = ( ) x ( ) x ( ) = ($ —)

CONTRACTUAL SERVICE COST, Misc. Items

Laboratory Equip. (Amortized)	(5,000)
Laboratory Equip. Maint. + Repair	(1,250)
Expendable Supplies	(1,000)
	( )
	( )

ANNUAL COST CONTRACTUAL SERVICES AND MISCELLANEOUS ITEMS = ($7,250)

ANNUAL COST RESIDUAL WASTE DISPOSAL = ($ —)

ANNUAL COST OF ROYALTIES, FEES, ETC. = ($ —)

ANNUAL DIRECT OPERATING COST = ($176,465)

TABLE 47 (cont.)
PART 3 of 4

POSITION	NUMBER		SALARY + BURDEN		COST PER YEAR
Engineer	(1/2)	x	($ 20,000)	=	($ 10,000)
Analy. Chemist	(1/5)	x	($ 17,000)	=	($ 3,400)
Lab Technician	(1/2)	x	($ 7,500)	=	($ 3,750)
Secretary	(1/20)	x	($ 7,500)	=	($ 375)
	( )	x	($)	=	($)
	( )	x	($)	=	($)
	( )	x	($)	=	($)
	( )	x	($)	=	($)
	( )	x	($)	=	($)
	( )	x	($)	=	($)

ANNUAL COST ADMINISTRATION AND STAFF = ($17,525)

SPECIAL ITEM

	($)
	($)
	($)
	($)
	($)

ANNUAL COST SPECIAL ITEMS = ($ —)

ANNUAL INDIRECT OPERATING COSTS = ($17,525)

SUMMARY

ANNUAL FIXED CHARGES =	($60,983)
ANNUAL DIRECT OPERATING COSTS =	($176,465)
ANNUAL INDIRECT OPERATING COSTS =	($ 17,525)
TOTAL ANNUAL COST EXCLUDING TAX CREDIT =	($254,973)

TABLE 47 (cont.)

PART 4 of 4

ANNUAL TAX CREDIT:

TAX DEPRECIATION METHOD Double Declining / Straight Line
DEPRECIATION LIFETIME FOR TAX PURPOSES 15 yrs.
DEPRECIABLE CAPITAL INVESTMENT .... = ($897,300)
INCOME TAX RATE 0.50

YEAR	DEPRECIATION RATE ($/year)							ANNUAL TAX CREDIT
1	(13.33 / 100)	x	(0.5)	x	($ ")	=	($ 59,805)
2	(11.56 / 100)	x	(0.5)	x	($ ")	=	($ 51,864)
3	(10.01 / 100)	x	(0.5)	x	($ ")	=	($ 44,910)
4	(8.68 / 100)	x	(0.5)	x	($ ")	=	($ 38,943)
5	(7.52 / 100)	x	(0.5)	x	($ ")	=	($ 33,738)
6	(6.52 / 100)	x	(0.5)	x	($ ")	=	($ 29,252)
7	(5.65 / 100)	x	(0.5)	x	($ ")	=	($ 25,349)
8	(4.90 / 100)	x	(0.5)	x	($ ")	=	($ 21,984)
9	(4.55 / 100)	x	(0.5)	x	($ ")	=	($ 20,414)
10	(4.55 / 100)	x	(0.5)	x	($ ")	=	($ 20,414)
11	(4.55 / 100)	x	(0.5)	x	($ ")	=	($ 20,414)
12	(4.55 / 100)	x	(0.5)	x	($ ")	=	($ 20,414)
13	(4.55 / 100)	x	(0.5)	x	($ ")	=	($ 20,414)
14	(4.55 / 100)	x	(0.5)	x	($ ")	=	($ 20,414)
15	(4.55 / 100)	x	(0.5)	x	($ ")	=	($ 20,414)
___	(/ 100)	x	( )	x	($)	=	($)
							($ 448,743)

DISCOUNTED TAX CREDIT:

TAX DEPRECIATION METHOD Double Declining / Straight Line
DEPRECIATION LIFETIME FOR TAX PURPOSES 15 years
INTEREST RATE 6 % /yr.
DEPRECIABLE CAPITAL INVESTMENT = ($897,300)
DISCOUNTED TAX CREDIT RATE (0.7119)
INCOME TAX RATE (0.5)
DISCOUNTED TAX CREDIT = (0.5) x (0.7119) x ($897,300) = ($319,075)

5. The depreciable capital investment is computed by subtracting land cost and salvage value from the installed process cost. For the example a value of $897,300 is obtained.

6. The next step involves the estimation of the useful lifetime of the process, namely the period over which it is to be depreciated for accounting purposes. This value may vary from industry to industry as suggested in the Data Manual and might also be different for various parts of the process, particularly if a general service facility such as a power generation station or a water reservoir has been included in the process. If the latter is the case, the user should note the useful lifetimes and corresponding depreciable capital investments separately. For the example, a reasonable value of 15 years is assumed for the entire process.

7. The interest rate on the sinking fund is recorded. A rate of 6% is chosen for illustration.

8. Based on the useful lifetime and the interest rate on the sinking fund, the annual value of the sinking fund factor is determined from Appendix B. For 15 years at 6%/yr. a value of 0.04296 is obtained.

9. The annual sinking fund payment is computed as the product of the annual sinking fund factor and the depreciable capital investment. For the example process this amounts to $38,550.

10. The salvage value is again recorded.

11. The annual credit for salvage value is computed as the product of the sinking fund factor and the salvage value. Zero is assumed in the example.

12. The cost of lump sum royalties, licenses, fees, etc. are recorded. For the example process no charges were applicable.

13. The annual fixed charge for lump sum royalties, licenses, fees, etc., assuming amortization over the useful lifetime of the process, is computed as the product of the sinking fund factor and the lump sum.

14. If a bond issue was used to finance a portion of the installed process cost, the amount of the bond issue is noted. In the example this is assumed not to be applicable.

15. The annual bond interest rate is recorded.

16. The annual amount of the interest on bonds is computed as the product of the amount of the bond issue and the annual bond interest rate.

17. The annual expenditure for rented buildings, equipment, etc. is entered into the worksheet next. In most cases this annual expense amounts to 8-10% of the value of the rented items except for specialized equipment where it can be considerably higher. For the example this entry is not applicable.

18. The amount of the investment to be insured is next recorded. This will depend on the individual company, location, age of facility, and perhaps local regulations. An amount of $897,300 is selected arbitrarily for the example.

19. The annual rate for insurance is noted next. In most cases this amounts to 0.4 to 1% based on the installed process cost. A value of 0.5% is arbitrarily chosen for the example.

20. The annual expenditure for insurance is computed as the product of the insured investment and the insurance rate. For the example, $4,487 is obtained.

21. The amount of the investment subject to property tax is noted. This can vary markedly with location. For illustration only, $897,300 is chosen for the example.

22. The annual property tax rate is recorded. This is generally in the range of 1-4% when based on the installed process cost but must be recognized to be location dependent. For illustration, a value of 2% per year is chosen in the example.

23. The annual expense for property tax is computed as the product of the taxable investment and the local tax rate. In the example, a value of $17,946 is obtained.

24. The annual fixed charges are then computed as the sum of its component parts. A value of $60,983 is obtained for the example process.

The step by step estimation of the annual direct operating cost for the example process is given next.

1. The individual annual requirements for raw materials are listed together with their unit prices. The annual cost of each is then computed. For the example, the supplemental Worksheet #E2-25 given in Table 48 is used to illustrate the procedure. The current reported costs of most raw materials may be found in the Oil, Paint, and Drug Reporter if they are not available to the user.

2. The direct operating cost for raw materials is then computed by summing the individual costs. For the quantities chosen in the example, an annual cost of $99,315 is obtained.

3. The individual annual requirements for utilities are listed together with their unit prices. The annual cost of each is then computed. For the example, the only significant utility is electricity for pumps. The total horsepower requirement was estimated from the individual equipment modules to be approximately 340 HP. This converts to approximately 2,200,000 kw hr.assuming continuous operation. Arbitrarily choosing $0.015/kw hr., a rate which will be location dependent, the annual cost is estimated at $33,000. Local utilities are the best source of the necessary cost data if such information is not available to the user.

4. The annual direct operating cost for utilities is computed by summing the individual costs.

5. The annual cost of maintenance is then estimated. For the example, the supplemental worksheet E2-26 given in Table 49. Each installed equipment module, its installation cost, the fraction of the installation cost required for annual maintenance (estimated using the Data Manual),and the resulting annual maintenance cost are noted. A total of

TABLE 48

WORKSHEET # E2-25 DATE: 3/16/73

EVALUATION OF ANNUAL RAW MATERIAL COSTS

PROCESS Dyestuff & Organic Chemical Wastewater Treatment

RAW MATERIAL	QUANTITY PER YEAR		UNIT PRICE		COST PER YEAR
Alum	(340 tons)	x	($79/ton)	=	($ 26,860)
Ammonia, anhydrous	(68 tons)	x	($126/ton)	=	($ 8,568)
Ammonia, aqueous	(23 tons)		($ 32/ton)	=	($ 736)
Caustic soda, 50%	(12 tons)		($73/ton)	=	($ 876)
Limestone	(6,350 tons)		($6.5/ton)	=	($ 41,275)
Phosphoric Acid, 75%	(80 tons)		($140/ton)	=	($ 11,200)
Quicklime	(490 tons)		($20/ton)	=	($ 9,800)
	( )		($)	=	($)
	( )		($)	=	($)
	( )		($)	=	($)
	( )		($)	=	($)
	( )		($)	=	($)
	( )		($)	=	($)
	( )		($)	=	($)
	( )		($)	=	($)
	( )		($)	=	($)
	( )		($)	=	($)
	( )		($)	=	($)
	( )		($)	=	($)

TOTAL = ($ 99,315)

TABLE 49

WORKSHEET # E2-26 DATE 3/16/73
Part 1/3

EVALUATION OF ANNUAL MAINTENANCE COSTS

PROCESS Dyestuff + Organic Chemical Wastewater Treatment

INSTALLED EQUIPMENT MODULE	INSTALLED COST		FRAC. MAINTENANCE PER YEAR		COST PER YEAR
- Thiosulfate Oxidation -					
Centrifugal Pump #1 : (E2-1)	($ 5,181)	x	(0.03)	=	($155.43)
Centrifugal Pump #2 : (E2-2)	($ 6,428)	x	(0.03)	=	($192.84)
Excav. + Reseed. : (E2-22)	($ 13,000)	x	(0.0075)	=	($ 97.50)
Piping to Lagoon : (E2-22)	($ 25,000)	x	(0.03)	=	($750.00)
Auxiliary Piping : (E2-22)	($ 12,500)	x	(0.03)	=	($375.00)
Piping Acid. Neut. : (E2-22)	($ 9,000)	x	(0.03)	=	($270.00)
- Ammonia Storage -					
Horiz. Tank #1 : (E2-3)	($ 29,400)	x	(0.02)	=	($588.00)
- Phosphoric Acid Storage -					
Pump #1 : (E2-4)	($ 125)	x	(0.10)	=	($ 12.50)
Vert. Tank #1 : (E2-5)	($ 44,000)	x	(0.02)	=	($880.00)
- Acid Equalization -					
Centrifugal Pump #3 : (E2-6)	($ 10,470)	x	(0.03)	=	($314.10)
Piping : (E2-22)	($ 8,900)	x	(0.03)	=	($267.00)
- Limestone System -					
Screw Conveyor : (E2-7)	($ 5,300)	x	(0.03)	=	($159.00)
Vert. Tank #2 : (E2-8)	($ 26,000)	x	(0.02)	=	($520.00)
Conveyor #1 : (E2-9)	($ 6,923)	x	(0.075)	=	($519.23)
Conveyor #2 : (E2-9)	($ 6,923)	x	(0.075)	=	($519.23)
- Settling Basin -					
Excavation	($ 32,900)	x	(0.0075)	=	($246.75)
- Alkaline Equalization -					
Centrifugal Pump #4 : (E2-10)	($ 16,956)	x	(0.03)	=	($508.68)
Sub TOTAL				=	($6,375.26)

TABLE 49 (cont.)

WORKSHEET # E2-26 DATE 3/16/73

Part 2/3

EVALUATION OF ANNUAL MAINTENANCE COSTS

PROCESS Dyestuff + Organic Chemical Wastewater Treatment

INSTALLED EQUIPMENT MODULE	INSTALLED COST		FRAC. MAINTENANCE PER YEAR		COST PER YEAR
Subtotal Part 1	($)	x	( )	=	($6,375.26)
Centrifugal Pump #5: (E2-10)	($ 16,956)	x	(0.03)	=	($ 508.68)
-Alkaline Oxidation-					
Pump #2: (E2-11)	($ 9,936)	x	(0.015)	=	($ 149.04)
Pump #3: (E2-12)	($ 2,250)	x	(0.015)	=	($ 33.75)
Horiz. Tank #2: (E2-13)	($ 22,000)	x	(0.03)	=	($660.00)
Lagoon Mod.: (E2-22)	($ 5,600)	x	(0.04)	=	($224.00)
Lime Slak.: (E2-22)	($ 2,800)	x	(0.01)	=	($ 28.00)
Var. Drive Pump #2: (E2-22)	($ 850)	x	(0.03)	=	($ 25.50)
Var. Drive Pump #3: (E2-22)	($ 850)	x	(0.03)	=	($ 25.50)
-Clarification-					
Thickener: (E2-14)	($ 240,000)	x	(0.01)	=	($2400.00)
Centrifugal Pump #6: (E2-15)	($ 22,022)	x	(0.03)	=	($ 660.66)
Centrifugal Pump #7: (E2-15)	($ 22,022)	x	(0.03)	=	($ 660.66)
Centrifugal Pump #8: (E2-16)	($ 17,898)	x	(0.03)	=	($536.94)
Centrifugal Pump #9: (E2-16)	($ 17,898)	x	(0.03)	=	($536.94)
Vert. Tank #3: (E2-17)	($ 9,000)	x	(0.02)	=	($180.00)
Vert. Tank #4: (E2-17)	($ 9,000)	x	(0.02)	=	($180.00)
Vert. Tank #5: (E2-17)	($ 9,000)	x	(0.02)	=	($ 180.00)
			TOTAL	=	($13,364.93)

TABLE 49 (cont.)

WORKSHEET # E2-26 DATE 3/16/73

Part 3/3

EVALUATION OF ANNUAL MAINTENANCE COSTS

PROCESS Dyestuff + Organic Chemical Wastewater Treatment

INSTALLED EQUIPMENT MODULE	INSTALLED COST		FRAC. MAINTENANCE PER YEAR		COST PER YEAR
Subtotal Part 2	($)	x	( )	=	($13,364.93)
Pump #4 : (E2-18)	($ 9,320)	x	(0.015)	=	($ 139.80)
Pump #5 : (E2-19)	($ 2,200)	x	(0.015)	=	($ 33.00)
Vert. Tank #6 : (E2-20)	($ 14,798)	x	(0.02)	=	($ 295.96)
- Control Room and Laboratory - Subcontracted : (E2-22)	($ 17,550)	x	(0.03)	=	($ 526.50)
- Chlorination - Chlorinator : (E2-22)	($ 22,200)	x	(0.10)	=	($ 2220.00)
Contact Basin : (E2-22)	($ 40,300)	x	(0.0075)	=	($ 302.25)
- Final Settling - Basin : (E2-22)	($ 11,100)	x	(0.0075)	=	($ 83.25)
- Post Aeration Basin - Excavation : (E2-22)	($ 5,600)	x	(0.0075)	=	($ 42.00)
Aerator : (E2-22)	($ 3,900)	x	(0.03)	=	($ 117.00)
	($)	x	( )	=	($)
	($)	x	( )	=	($)
	($)	x	( )	=	($)
	($)	x	( )	=	($)
	($)	x	( )	=	($)
	($)	x	( )	=	($)
	($)	x	( )	=	($)
TOTAL				=	($17,124.69)

approximately $17,100 is obtained.

6. The annual cost of operator labor is then estimated. A list of installed equipment modules together with an estimate of the requirements for each (refer to Data Manual for the usual range of requirements) may be made using a supplemental worksheet. For the example chosen, operator requirements are minimal on an item by item basis. Requirements based on the overall process are estimated to be 3 men per day to carry out the functions of operator, analytical technician, and material handler. At an average salary of $5,500 per year, plus an additional 20% burden, the annual operator cost is estimated to be $19,800.

7. to 14. The annual costs for supervisors and foremen are next detailed. For the example, negligible cost is assumed because of the small operator requirements.

15. Annual contractual services together with miscellaneous annual direct operating items are listed. For the example, an annual amortized cost of $5,000 is estimated for purchased laboratory equipment not considered in evaluating the installed process cost. A cost of $1,250 has been assumed for a contract for laboratory maintenance and repair. Also expendable laboratory supplies has been listed as $1,000 a year.

16. The annual cost of contractual services and miscellaneous items is then computed as the sum of the individual costs. For purposes of the illustration, $7,250 is obtained.

17. The annual cost of residual waste disposal, if applicable, is considered next. In most cases this would be evaluated on a quantity per year, unit price, and, subsequently, annual cost for each material requiring residual disposal. For the example, this cost is assumed negligible.

18. The annual cost of royalties, licenses, and fees related to rate of production, if applicable, is next entered. For the example, this category is not applicable.

19. The annual direct operating cost is computed by summing its component parts. A value of $176,465 results for the sample calculation.

The estimation of the annual indirect operating costs for the example process follows on the worksheet. For purposes of illustration, the following step by step procedure is used.

1. The individual requirements for administrative personnel and staff are listed together with the annual salary and burden of each. The annual cost of each requirement is subsequently computed. For the example, the requirements chosen for illustration include part time efforts by an engineer, an analytical chemist, a lab technician, and a secretary.

2. The annual cost for administration and staff is computed by summing the individual requirements. For the illustration, an annual cost of $17,525 is obtained.

3. and 4. The annual cost of special indirect items is detailed next. For the example,none of the variety of possible expenses under this category are detailed.

5. The annual indirect cost is computed by adding the annual costs of administration, staff, and special indirect items. For the illustration, $17,525 is obtained.

Adding, in the next section of the worksheet, the annual fixed charges, the annual direct operating costs, and the annual indirect operating costs, the annual process cost excluding the tax credit is obtained. For the example evaluation, a total estimate of approximately $255,000 is obtained.

The annual tax credits are computed next for the example.

1. The double declining switching to straight line depreciation method is chosen for the example.

2. A depreciation lifetime for tax purposes of 15 years is selected.

3. The amount of the depreciable capital investment ($897,300) is recorded.

4. An income tax rate of 50% is assumed.

5. The annual tax credit is then computed for each year in the process lifetime by multiplying the annual depreciation rate (determined from Appendix C) by the income tax rate and the amount of the depreciable capital investment. For the example the annual tax credit ranges from $59,805 in year 1 to $20,414 during the last years of the process lifetime.

The last procedure illustrated for the example is the evaluation of the discounted tax credit.

1. The depreciation method double declining switching to straight line is chosen for the example.

2. A depreciation lifetime for tax purposes of 15 years is selected.

3. An interest rate of 6% is arbitrarily assumed.

4. The amount of the depreciable capital investment ($897,300) is recorded.

5. The discounted tax credit rate is found to be 0.71119 from Appendix D.

6. An income tax rate of 50%/yr. is arbitrarily assumed.

7. The discounted tax credit is computed by multiplying the discounted tax credit rate, the income tax rate, and the amount of the depreciable capital investment. A value of $319,075 is obtained for the example.

SECTION XI

ESTIMATION OF PROFIT

The elements comprising profit as well as the more common indices used to compare profit have been discussed in detail in Section IV: POLLUTION CONTROL ECONOMICS. In this section this information is re-iterated in worksheet form and step by step instructions for completing the worksheets are given.

The first worksheet presented, Table 50, details the calculation of several annual indices of profit.

1. The process under consideration is first noted.
2. The various marketable products from the process are then recorded, the market volume per year and the per volume selling price of each detailed, and the annual sales computed as the product of the volume and the per volume price.
3. The total annual sales is computed as the sum of the annual sales of each product.
4. The total annual process cost exclusive of the annual tax credit, as determined in the worksheet given in Table 41, is recorded.
5. The annual payments to the sinking fund for depreciable capital investment and lump sum royalties, licenses, fees, etc. as determined in the worksheet given in Table 41, is listed.
6. The annual fixed credit (a positive number) for salvage value, as determined in the worksheet given in Table 41, is recorded.
7. The annual gross profit is evaluated as the total annual sales, less the total annual process cost exclusive of the annual tax credit, plus the annual sinking fund payments, and less the annual fixed credit for salvage value.
8. The annual sinking fund payments are listed again.

TABLE 50

WORKSHEET # __________ DATE ____________

ESTIMATION OF ANNUAL PROFIT INDICES

PROCESS ______________

PRODUCT VOLUME PER YEAR PER VOLUME SALE PRICE ANNUAL SALES

( ) x ( ) = ( )

TOTAL ANNUAL SALES ($) (+)

TOTAL ANNUAL PROCESS COST (EXCLUSIVE OF ANNUAL TAX CREDIT) ($) (-)

ANNUAL SINKING FUND PAYMENTS ($) (+)

ANNUAL FIXED CREDIT FOR SALVAGE VALUE ($) (-)

ANNUAL GROSS PROFIT ($)(+)

ANNUAL SINKING FUND PAYMENTS ($)(-)

ANNUAL TAX CREDIT ($)(+)

INCOME TAX RATE

ANNUAL INCOME TAXES EXCLUDING TAX CREDIT = ( ) x ( ) = ($) (-)

ANNUAL NET PROFIT = ($) (+)

MINIMUM ACCEPTABLE ANNUAL RETURN RATE

WORKING CAPITAL

INSTALLED PROCESS COST

MINIMUM ACCEPTABLE ANNUAL RETURN = ( ) + ( ) x ( ) = ($)(-)

ANNUAL VENTURE PROFIT =

ANNUAL PERCENTAGE RATE OF RETURN

= 100(ANNUAL NET PROFIT)/(INSTALLED PROCESS COST + WORKING CAPITAL)

= 100( )/(+)

PAYOUT TIME = (INSTALLED PROCESS COST/TOTAL ANNUAL SALES

= (/) years

9. The annual tax credit, as determined from the worksheet in Table 41, is listed for the year being considered or a suitable average is chosen.

10. The annual income tax rate is recorded.

11. The annual amount of the income taxes,before the annual tax credit is used to reduce the amount of the tax,is computed as the product of the annual income tax rate and the annual gross profit. (The total annual income tax would be the amount before the tax credit less the amount of the tax credit.)

12. The annual net profit is the annual gross profit, less the annual sinking fund payments, plus the annual tax credit, less the annual income taxes exclusive tax credit.

13. The minimum acceptable annual return rate is given next.

14. The amount required for working capital is then specified.

15. The installed process cost, as determined using the worksheet given in Table 13, is recorded.

16. The minimum acceptable annual return is computed by multiplying the minimum acceptable annual return rate by the sum of the working capital and the installed process cost.

17. The annual venture profit is computed as being the annual net profit less the minimum accpetable annual return.

18. The annual percentage rate of return is computed as being 100 times the annual net profit divided by the sum of the installed process cost and the working capital.

19. Payout time is computed by dividing the installed process cost by the total annual sales.

In the general case where annual sales, annual process costs, and annual tax credit change with time, the worksheet in Table 50 may have to be evaluated for each year. If this is done, the venture worth of the process, defined as the sum of the present value of the annual venture profits,may be computed.

By definition:

$$W = \sum_{k=1}^{L} \frac{V_k}{(1+i)^k}$$

where

W = venture worth

k = index indicating year

L = process lifetime, years

i = interest rate earned on money

V_k = venture profit during year k

The step by step procedure for determining this sum is determined in the worksheet given in Table 51.

Alternately the equation

$$W = \sum_{k=1}^{L} \frac{(1-t)G_k}{(1+i)^k} + \sum_{k=1}^{L} \frac{d_{t,k}t(DC)}{(1+i)^k}$$

$$-\left[\frac{(1+i)^L - 1)}{i\,(1+i)^L}\right] (i_m - i)\,(DC + WC)$$

$$- DC$$

$$-\left[\frac{(1+i)^L - 1}{(1+i)^L}\right](WC) + \left[\frac{(1-t)}{(1+i)^L}\right](SV)$$

TABLE 51

WORKSHEET # __________ DATE: _________

ESTIMATION OF VENTURE WORTH

PROCESS __________________

INTEREST RATE i ___________

YEAR	PRESENT VALUE FACTOR		ANNUAL VENTURE PROFIT		PRESENT VALUE
1	$1/(1+i)$ = ( )	x	($)	=	($)
2	$1/(1+i)^2$ = ( )	x	($)	=	($)
3	$1/(1+i)^3$ = ( )	x	($)	=	($)
4	$1/(1+i)^4$ = ( )	x	($)	=	($)
5	$1/(1+i)^5$ = ( )	x	($)	=	($)
6	$1/(1+i)^6$ = ( )	x	($)	=	($)
7	$1/(1+i)^7$ = ( )	x	($)	=	($)
8	$1/(1+i)^8$ = ( )	x	($)	=	($)
9	$1/(1+i)^9$ = ( )	x	($)	=	($)
10	$1/(1+i)^{10}$ = ( )	x	($)	=	($)
11	$1/(1+i)^{11}$ = ( )	x	($)	=	($)
12	$1/(1+i)^{12}$ = ( )	x	($)	=	($)
13	$1/(1+i)^{13}$ = ( )	x	($)	=	($)
14	$1/(1+i)^{14}$ = ( )	x	($)	=	($)
15	$1/(1+i)^{15}$ = ( )	x	($)	=	($)

VENTURE WORTH = ($)

where

W = venture worth

L = project lifetime in years

t = income tax rate

i = interest rate earned on money

G_k = gross profit for year k

$d_{t,k}$ = annual depreciation rate for tax purposes for year k

DC = depreciable capital investment

i_m = minimum acceptable rate of return

WC = working capital

SV = salvage value

can be used to evaluate the venture worth. Appendix D may be used to evaluate the discounted tax credit rate.

$$\sum_{k=1}^{L} \frac{d_{t,k}}{(1+i)^k}$$

and, if G_k remains constant with k at G,

$$\sum_{k=1}^{L} \frac{(1-t)G_k}{(1+i)^k}$$

can be replaced by

$$(1-t)\ G \quad \left[\frac{(1+i)^L - 1}{i\ (1+i)^L}\right]$$

to simplify the calculation.

SECTION XII

ACKNOWLEDGEMENTS

This project was directed by Mr. Herbert G. Blecker. Assistance in this effort by many individuals in and out of government has been extremely helpful. We especially acknowledge those vendors and contractors who have assisted in the effort. We are grateful for the guidance provided by Mr. Paul Greenberger and other members of the Environmental Protection Agency Staff.

SECTION XIII

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SECTION XIV

GLOSSARY

Adjustment Factor - An additive or multiplicative factor for adjusting installed base cost to obtain installed cost. The adjustments may be regional (for location of installation), design (for the type of design), pressure, temperature, cost escalation, or other pertinent parameters.

Cost Escalation Factor - See Adjustment Factor, a composite of the Marshall & Stevens Index and the Engineering News Record Construction Cost Index.

Design Adjustment Factor - See Adjustment Factor.

Equipment Item - A piece of processing equipment. Generally refers to the piece as purchased and before installation.

Installed Base Cost - The installed cost for an equipment module in a nominal location with nominal design and operating characteristics.

Installed Cost - The cost including purchased equipment, material and labor requirements for installation, contractors engineering and overhead. For processes, includes contractors fee, contingencies, and land cost as well.

Installed Equipment Module - An equipment item together with its usual accessories, all completely installed.

Key Cost Parameter - The single physical or capacity characteristic of an installed equipment module which is most directly related to installed cost.

Labor to Material Ratio - The ratio of labor to material requirements in installed equipment module.

Pressure Adjustment Factor - See Adjustment Factor.

Regional Adjustment Factor - See Adjustment Factor.

Subcontract Cost - The fee paid to another by the contractor for services, such as erecting a building, completing yard improvements, etc.

Temperature Adjustment Factor - See Adjustment Factor.

GLOSSARY

Additional glossaries may be found in

1. Industrial & Engineering Chemistry 52 (6), 69 (1960).
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SECTION XV

APPENDICES

		Page No.
A.	Blank WorkSheets	160
B.	Values of Annual Sinking Fund Factor	180
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APPENDIX A

BLANK WORKSHEETS

WORK SHEET #______ DATE:__________

ESTIMATION OF INSTALLED COST FOR A SINGLE INSTALLED EQUIPMENT MODULE (REGIONAL ADJUSTMENT FACTOR ONLY)

EQUIPMENT MODULE:________________________________

DATA SHEET NUMBERS:______________________________

KEY COST PARAMETER:______________ ( )

1972 INSTALLED BASE COST:........( )

ADJUSTMENT:

Regional·····,F_R = _____;#____

1972 INSTALLED COST =( )x($)=($)

INSTALLATION DATE:____________

COST ESCALATION FACTOR:________________;___

INSTALLED COST = ( ) x ($) = ($)
(Installation Date)

WORK SHEET #_______ DATE:__________

ESTIMATION OF INSTALLED COST FOR A SINGLE INSTALLED EQUIPMENT MODULE
(ADJUSTMENT FACTORS ARE MULTIPLIED)

EQUIPMENT MODULE:______________________
DATA SHEET NUMBERS:____________________
KEY COST PARAMETER:_____________________( )
CHARACTERISTIC INSTALLED BASE COST CURVE IF APPLICABLE ( )
1972 INSTALLED BASE COST: ($)

ADJUSTMENTS:
Regional............. F_R = ;
___________..........x = ;
___________..........x = ;
___________..........x = ;
___________..........x = ;
___________..........x = ;

ADJUSTMENT PRODUCT = _______

1972 INSTALLED COST = ( ) ($) = ($)

INSTALLATION DATE:_________

COST ESCALATION FACTOR:__________;________

INSTALLED COST = ( ) x ( ) = ($)
(Installation Date)

WORK SHEET # DATE:__________

ESTIMATION OF INSTALLED COST FOR A SINGLE INSTALLED EQUIPMENT MODULE
(GENERALIZED WORK SHEET)

EQUIPMENT MODULE:__________________________
DATA SHEET NUMBERS:________________________
KEY COST PARAMETER: _______________________( )
CHARACTERISTIC INSTALLED BASE COST CURVE IF APPLICABLE ( )
1972 INSTALLED BASE COST: ($)

ADJUSTMENTS:
Regional.................. F_R = ;
_______________.......... = ;
_______________.......... = ;
_______________.......... = ;
_______________.......... = ;

OTHER PARAMETERS:
_______________.......... = ;
_______________.......... = ;
_______________.......... = ;

CHARACTERISTIC ADJUSTMENT EQUATION:

1972 INSTALLED COST = (1972 Installed Base Cost)________________

1972 INSTALLED COST = (__________________________) = ($)

INSTALLATION DATE:__________
COST ESCALATION FACTOR:_____;_____
INSTALLED COST = ( ) x ( ) = ($)
(installation date)

WORK SHEET #______ DATE:_____

EVALUATION OF THE COST ESCALATION FACTOR

EQUIPMENT MODULE ____________________

INSTALLED EQUIPMENT MODULE COST (Mid 1972) _________ ;Work Sheet #____

INSTALLATION DATE _________

MS INDEX AT INSTALLATION DATE _________

(1946 = 100)

(L/M) RATIO _________

MS ESCALATION FACTOR =(1.-0.5(   ))(/330) = (   )

(Set to 0.0 if (L/M) is not known)

ENR INDEX AT INSTALLATION DATE _________

(1913 = 100)

(L/M) RATIO _________

ENR ESCALATION FACTOR = 0.5(   )(/1744) = (   )

(Set to 1.0 if (L/M) is not known)

COST ESCALATION FACTOR = (+   )   = (   )

ESTIMATED INSTALLED COST AT INSTALLATION DATE = (   )x(   )=($)

WORK SHEET #__________ DATE:__________

ESTIMATION OF THE ANNUAL COST OF A SINGLE INSTALLED EQUIPMENT MODULE

INSTALLED EQUIPMENT MODULE ____________________

INSTALLED COST ($) ; Worksheet # __________

SALVAGE VALUE -($)

DEPRECIABLE INVESTMENT..($)

USEFUL LIFETIME _____ years

SINKING FUND INTEREST RATE_____ %/yr.

SINKING FUND FACTOR..( )

FIXED CHARGE DEPRECIABLE INVESTMENT ( )x($) =($)

FIXED CHARGE NONDEPRECIABLE SALVAGE VALUE = ( )x($) =-($)

Salvage Value

MAINTENANCE AS FRACTION OF INSTALLED COST = ( )

DIRECT OPERATING COST FOR MAINTENANCE = ( ) x ($) =($)

OPERATORS REQUIRED PER SHIFT ....( )

SHIFTS PER DAY........................ ( )

ANNUAL OPERATOR SALARY + BURDEN =($)

ANNUAL OPERATOR COST =($)x( )x( ) =($)

SUPERVISOR REQUIRED PER SHIFT............ ( )

SHIFTS PER DAY ....( )

ANNUAL SUPERVISOR SALARY + BURDEN_____

ANNUAL SUPERVISOR COST =($)x( )x( ) =($)

FOREMAN REQUIRED PER SHIFT....................( )

SHIFTS PER DAY........................( )

ANNUAL FOREMAN SALARY + BURDEN =($)

ANNUAL FOREMAN COST =($)x( )x( ) =($)

UTILITY	QUANTITY PER YEAR	UNIT PRICE	COST PER YEAR
________	( )x	( )=	($)
________	( )x	( )=	($)
________	( )x	( )=	($)
________	( )x	( )=	($)

DIRECT OPERATING COST FOR UTILITIES =($)

TAX DEPRECIATION METHOD STRAIGHT LINE

DEPRECIATION LIFETIME____ years

DEPRECIATION RATE PER YEAR( )

INCOME TAX RATE ( )

TAX CREDIT = ( )x( )x( )=($)

TAX CREDIT CONTRIBUTION TO ANNUAL COST =-($) =-($)

ESTIMATED ANNUAL COST =($)

WORK SHEET #________ DATE:____________

ESTIMATION OF THE INSTALLED PROCESS COST

PROCESS____

INSTALLED EQUIPMENT MODULE INSTALLED COST

____________;Worksheet #_____ ($)

____________;Worksheet #_____ ($)

____________;Worksheet #_____ ($)

____________;Worksheet #_____ ($)

____________;Worksheet #_____ ($)

TOTAL INSTALLED EQUIPMENT MODULES COST =($)

SPECIAL ITEMS INSTALLED COST

______________________________ ($)

______________________________ ($)

______________________________ ($)

______________________________ ($)

______________________________ ($)

TOTAL SPECIAL ITEMS INSTALLED COST =($)

BARE PLANT COST =($)

PERCENT CONTINGENCIES OF BARE PLANT COST _____

CONTINGENCIES = (/100)x($) =($)

CONTRACTORS FEE AS A PERCENT OF BARE PLANT COST _____

CONTRACTORS FEE = (/100)x($) =($)

COST OF LAND =($)

TOTAL INSTALLED COST =($)

WORKSHEET #__________ DATE______________

PROCESS____

INSTALLED EQUIPMENT MODULE INSTALLED COST

____________; Worksheet #__________ ($)

____________; Worksheet #__________ ($)

____________; Worksheet #__________ ($)

____________; Worksheet #__________ ($)

____________; Worksheet #__________ ($)

____________; Worksheet #__________ ($)

____________; Worksheet #__________ ($)

____________; Worksheet #__________ ($)

____________; Worksheet #__________ ($)

____________; Worksheet #__________ ($)

____________; Worksheet #__________ ($)

____________; Worksheet #__________ ($)

____________; Worksheet #__________ ($)

____________; Worksheet #__________ ($)

____________; Worksheet #__________ ($)

____________; Worksheet #__________ ($)

____________; Worksheet #__________ ($)

____________; Worksheet #__________ ($)

____________; Worksheet #__________ ($)

____________; Worksheet #__________ ($)

____________; Worksheet #__________ ($)

____________; Worksheet #__________ ($)

- -

SUBTOTAL INSTALLED EQUIPMENT MODULES COST ($)

WORKSHEET # ____________________ DATE ________________

PROCESS ____

SPECIAL ITEMS	INSTALLED COST
	($)
	($)
	($)
	($)
	($)
	($)
	($)
	($)
	($)
	($)
	($)
	($)
	($)
	($)
	($)
	($)
	($)
	($)
	($)
	($)

- -

SUBTOTAL SPECIAL ITEMS INSTALLED COST ($)

PART 1 of 4

WORKSHEET # ______________ DATE: ____________

ESTIMATION OF ANNUAL PROCESS COST

1. PROCESS ____

2. INSTALLED PROCESS COST =($) Worksheet # ________
   (Excluding Working Capital)

3. LAND COST =($)(-)

4. SALVAGE VALUE =($)(-)

---

5. DEPRECIABLE CAPITAL INVESTMENT= ($)

6. USEFUL LIFETIME _____ YEARS

7. SINKING FUND INTEREST RATE _____%/yr.

8. SINKING FUND FACTOR ( )

9. ANNUAL SINKING FUND PAYMENT ( )x( ) = ($)

10. SALVAGE VALUE ($)

11. FIXED CHARGE FOR SALVAGE VALUE ( )x( ) = -($)

12. ROYALTIES, FEES, ETC. ($)

13. FIXED CHARGE FOR ROYALTIES, FEES, ETC. ( )x( ) = ($)

14. AMOUNT OF BOND ISSUE ($)

15. ANNUAL BOND INTEREST RATE______ %/yr.

16. ANNUAL BOND INTEREST = (/100)x($) = ($)

17. ANNUAL RENT = ($)

18. INVESTMENT INSURED ($)

19. ANNUAL INSURANCE RATE_____%/yr.

20. ANNUAL INSURANCE = (/100)x($) = ($)

21. INVESTMENT PROPERTY TAXED ($)

22. ANNUAL PROPERTY TAX RATE __________ %/yr.

23. ANNUAL PROPERTY TAX = (/100)x($) = ($)

---

24. ANNUAL FIXED CHARGES ($)

PART 2 of 4

RAW MATERIAL	QUANTITY PER YEAR		UNIT PRICE		COST PER YEAR	
______________	( )	x	($)	=	($)	
______________	( )	x	($)	=	($)	
______________	( )	x	($)	=	($)	
______________	( )	x	($)	=	($)	
______________	( )	x	($)	=	($)	
______________	( )	x	($)	=	($)	
______________	( )	x	($)	=	($)	
DIRECT OPERATING COST FOR RAW MATERIALS				=		($)

UTILITY	QUANTITY PER YEAR		UNIT PRICE		COST PER YEAR	
______________	( )	x	($)	=	($)	
______________	( )	x	($)	=	($)	
______________	( )	x	($)	=	($)	
______________	( )	x	($)	=	($)	
______________	( )	x	($)	=	($)	
DIRECT OPERATING COST FOR UTILITIES				=		($)

ANNUAL MAINTENANCE COST = ($)

ANNUAL OPERATOR COST = ($)

SUPERVISORS REQUIRED PER SHIFT ( )

SHIFTS PER DAY ( )

ANNUAL SUPERVISOR SALARY + BURDEN ( )

ANNAUL SUPERVISOR COST = ( ) x ( ) x ( ) = ($)

FOREMEN REQUIRED PER SHIFT ( )

SHIFTS PER DAY ( )

ANNUAL FOREMAN SALARY + BURDEN ( )

ANNUAL FOREMEN COST = ( ) x ( ) x ( ) = ($)

CONTRACTUAL SERVICE COST

____( )

____( )

____( )

____( )

____( )

ANNUAL COST CONTRACTUAL SERVICES AND MISCELLANEOUS ITEMS = ($)

ANNUAL COST RESIDUAL WASTE DISPOSAL = ($)

ANNUAL COST OF ROYALTIES, FEES, ETC. = ($)

ANNUAL DIRECT OPERATING COST = ($)

PART 3 of 4

POSITION	NUMBER		SALARY + BURDEN		COST PER YEAR
________	( )	x	($)	=	($)
________	( )	x	($)	=	($)
________	( )	x	($)	=	($)
________	( )	x	($)	=	($)
________	( )	x	($)	=	($)
________	( )	x	($)	=	($)
________	( )	x	($)	=	($)
________	( )	x	($)	=	($)
________	( )	x	($)	=	($)
________	( )	x	($)	=	($)

ANNUAL COST ADMINISTRATION AND STAFF = ($)

SPECIAL ITEM

________________________ ($)

________________________ ($)

________________________ ($)

________________________ ($)

________________________ ($)

ANNUAL COST SPECIAL ITEMS = ($)

ANNUAL INDIRECT OPERATING COSTS = ($)

SUMMARY

ANNUAL FIXED CHARGES = ($)

ANNUAL DIRECT OPERATING COSTS = ($)

ANNUAL INDIRECT OPERATING COSTS = ($)

TOTAL ANNUAL COST EXCLUDING TAX CREDIT = ($)

PART 4 of 4

ANNUAL TAX CREDIT:

TAX DEPRECIATION METHOD ________________________________

DEPRECIATION LIFETIME FOR TAX PURPOSES ____________________

DEPRECIABLE CAPITAL INVESTMENT .... = ($)

INCOME TAX RATE ____________________________

YEAR	DEPRECIATION RATE (%/year)				ANNUAL TAX CREDIT
____	(/ 100)	x ( ) x	($)	=	($)
____	(/ 100)	x ( ) x	($)	=	($)
____	(/ 100)	x ( ) x	($)	=	($)
____	(/ 100)	x ( ) x	($)	=	($)
____	(/ 100)	x ( ) x	($)	=	($)
____	(/ 100)	x ( ) x	($)	=	($)
____	(/ 100)	x ( ) x	($)	=	($)
____	(/ 100)	x ( ) x	($)	=	($)
____	(/ 100)	x ( ) x	($)	=	($)
____	(/ 100)	x ( ) x	($)	=	($)
____	(/ 100)	x ( ) x	($)	=	($)
____	(/ 100)	x ( ) x	($)	=	($)
____	(/ 100)	x ( ) x	($)	=	($)
____	(/ 100)	x ( ) x	($)	=	($)
____	(/ 100)	x ( ) x	($)	=	($)
____	(/ 100)	x ( ) x	($)	=	($)

					($)

DISCOUNTED TAX CREDIT:

TAX DEPRECIATION METHOD ____________________________

DEPRECIATION LIFETIME FOR TAX PURPOSES ________________

INTEREST RATE ____________ % ________

DEPRECIABLE CAPITAL INVESTMENT = ($)

DISCOUNTED TAX CREDIT RATE ( )

INCOME TAX RATE ( )

DISCOUNTED TAX CREDIT = ( ) x ( ) x ($) = ($)

WORKSHEET #________________ DATE:______________

EVALUATION OF ANNUAL RAW MATERIAL COSTS

PROCESS____

RAW MATERIAL	QUANTITY PER YEAR		UNIT PRICE		COST PER YEAR
________________	( )	x	($)	=	($)
________________	( )	x	($)	=	($)
________________	( )		($)	=	($)
________________	( )		($)	=	($)
________________	( )		($)	=	($)
________________	( )		($)	=	($)
________________	( )		($)	=	($)
________________	( )		($)	=	($)
________________	( )		($)	=	($)
________________	( )		($)	=	($)
________________	( )		($)	=	($)
________________	( )		($)	=	($)
________________	( )		($)	=	($)
________________	( )		($)	=	($)
________________	( )		($)	=	($)
________________	( )		($)	=	($)
________________	( )		($)	=	($)
________________	( )		($)	=	($)
________________	( )		($)	=	($)

- -

TOTAL = ($)

WORKSHEET #____________________ DATE________________

EVALUATION OF ANNUAL UTILITY COSTS

PROCESS____

UTILITY	QUANTITY PER YEAR		UNIT PRICE		COST PER YEAR
__________	( )	x	($)	=	($)
__________	( )	x	($)	=	($)
__________	( )	x	($)	=	($)
__________	( )	x	($)	=	($)
__________	( )	x	($)	=	($)
__________	( )	x	($)	=	($)
__________	( )	x	($)	=	($)
__________	( )	x	($)	=	($)
__________	( )	x	($)	=	($)
__________	( )	x	($)	=	($)
__________	( )	x	($)	=	($)
__________	( )	x	($)	=	($)
__________	( )	x	($)	=	($)
__________	( )	x	($)	=	($)
__________	( )	x	($)	=	($)
__________	( )	x	($)	=	($)
__________	( )	x	($)	=	($)
__________	( )	x	($)	=	($)
__________	( )	x	($)	=	($)
__________	( )	x	($)	=	($)

- -

TOTAL = ($)

WORKSHEET #________________ DATE________________

EVALUATION OF ANNUAL MAINTENANCE COSTS

PROCESS____

INSTALLED EQUIPMENT MODULE	INSTALLED COST		FRAC. MAINTENANCE PER YEAR		COST PER YEAR
____________________	($)	x	( )	=	($)
____________________	($)	x	( )	=	($)
____________________	($)	x	( )	=	($)
____________________	($)	x	( )	=	($)
____________________	($)	x	( )	=	($)
____________________	($)	x	( )	=	($)
____________________	($)	x	( )	=	($)
____________________	($)	x	( )	=	($)
____________________	($)	x	( )	=	($)
____________________	($)	x	( )	=	($)
____________________	($)	x	( )	=	($)
____________________	($)	x	( )	=	($)
____________________	($)	x	( )	=	($)
____________________	($)	x	( )	=	($)
____________________	($)	x	( )	=	($)
____________________	($)	x	( )	=	($)
____________________	($)	x	( )	=	($)
		TOTAL		=	($)

WORKSHEET # ______ DATE:____________

EVALUATION OF MANUAL OPERATOR REQUIREMENTS

INSTALLED EQUIPMENT MODULE	OPERATORS PER SHIFT		SHIFTS PER DAY		OPERATOR REQUIREMENT PER DAY
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
______________________________	( )	X	( )	=	( )
			TOTAL	=	( )

WORKSHEET #__________________ DATE:____________

EVALUATION OF ANNUAL CONTRACTURAL SERVICES AND MISCELLANEOUS ITEMS

PROCESS____

ITEM	COST PER YEAR
____	($)
____	($)
____	($)
____	($)
____	($)
____	($)
____	($)
____	($)
____	($)
TOTAL =	($)

WORKSHEET # ____________ DATE ______________

ESTIMATION OF ANNUAL PROFIT INDICES

PROCESS__________________

PRODUCT VOLUME PER YEAR PER VOLUME SALE PRICE ANNUAL SALES

( ) x ( ) = ( )

TOTAL ANNUAL SALES ($) (+)

TOTAL ANNUAL PROCESS COST (EXCLUSIVE OF ANNUAL TAX CREDIT) ($) (-)

ANNUAL SINKING FUND PAYMENTS ($) (+)

ANNUAL FIXED CREDIT FOR SALVAGE VALUE ($) (-)

ANNUAL GROSS PROFIT ($)(+)

ANNUAL SINKING FUND PAYMENTS ($)(-)

ANNUAL TAX CREDIT ($)(+)

INCOME TAX RATE

ANNUAL INCOME TAXES = ( ) x ( ) = ($) (-)
EXCLUDING TAX
CREDIT

ANNUAL NET PROFIT = ($) (+)

MINIMUM ACCEPTABLE ANNUAL RETURN RATE

WORKING CAPITAL

INSTALLED PROCESS COST

MINIMUM ACCEPTABLE ANNUAL RETURN = ( ) + ( ) x ( ) = ($)(-)

ANNUAL VENTURE PROFIT =

ANNUAL PERCENTAGE RATE OF RETURN

= 100(ANNUAL NET PROFIT)/(INSTALLED PROCESS COST + WORKING CAPITAL)

= 100( )/(+)

PAYOUT TIME = (INSTALLED PROCESS COST/TOTAL ANNUAL SALES

= (/) years

WORKSHEET # __________ DATE: ________

ESTIMATION OF VENTURE WORTH

PROCESS________________

INTEREST RATE i __________

YEAR	PRESENT VALUE FACTOR		ANNUAL VENTURE PROFIT		PRESENT VALUE
1	$1/(1+i)$ =( )	x	($)	=	($)
2	$1/(1+i)^2$ =( )	x	($)	=	($)
3	$1/(1+i)^3$ =( )	x	($)	=	($)
4	$1/(1+i)^4$ =( )	x	($)	=	($)
5	$1/(1+i)^5$ =( )	x	($)	=	($)
6	$1/(1+i)^6$ =( )	x	($)	=	($)
7	$1/(1+i)^7$ =( )	x	($)	=	($)
8	$1/(1+i)^8$ =( )	x	($)	=	($)
9	$1/(1+i)^9$ =( )	x	($)	=	($)
10	$1/(1+i)^{10}$ =( )	x	($)	=	($)
11	$1/(1+i)^{11}$ =( )	x	($)	=	($)
12	$1/(1+i)^{12}$ =( )	x	($)	=	($)
13	$1/(1+i)^{13}$ =( )	x	($)	=	($)
14	$1/(1+i)^{14}$ =( )	x	($)	=	($)
15	$1/(1+i)^{15}$ =( )	x	($)	=	($)
			VENTURE WORTH	=	($)

APPENDIX B

VALUES OF ANNUAL SINKING FUND FACTOR

SINKING FUND DEPOSIT FACTOR

INTEREST RATE
(% PER YEAR)

DEPRECIATION PERIOD

YEARS	.00	.25	.50	.75	1.00	1.25	1.50	1.75	2.00	2.25
3	.33333	.33250	.33167	.33085	.33002	.32920	.32838	.32757	.32675	.32594
4	.25000	.24907	.24813	.24721	.24628	.24536	.24445	.24353	.24262	.24172
5	.20000	.19900	.19801	.19702	.19604	.19506	.19409	.19312	.19216	.19120
6	.16667	.16563	.16460	.16357	.16255	.16153	.16053	.15952	.15853	.15754
7	.14286	.14179	.14073	.13968	.13863	.13759	.13656	.13553	.13451	.13350
8	.12500	.12391	.12283	.12176	.12069	.11963	.11858	.11754	.11651	.11548
9	.11111	.11001	.10891	.10782	.10674	.10567	.10461	.10356	.10252	.10148
10	.10000	.09888	.09777	.09667	.09558	.09450	.09343	.09238	.09133	.09029
11	.09091	.08978	.08866	.08755	.08645	.08537	.08429	.08323	.08218	.08114
12	.08333	.08219	.08107	.07995	.07885	.07776	.07668	.07561	.07456	.07352
13	.07692	.07578	.07464	.07352	.07241	.07132	.07024	.06917	.06812	.06708
14	.07143	.07028	.06914	.06801	.06690	.06581	.06472	.06366	.06260	.06156
15	.06667	.06551	.06436	.06324	.06212	.06103	.05994	.05888	.05783	.05679
16	.06250	.06134	.06019	.05906	.05794	.05685	.05577	.05470	.05365	.05262
17	.05882	.05766	.05651	.05537	.05426	.05316	.05208	.05102	.04997	.04894
18	.05556	.05438	.05323	.05210	.05098	.04988	.04881	.04774	.04670	.04568
19	.05263	.05146	.05030	.04917	.04805	.04696	.04588	.04482	.04378	.04276
20	.05000	.04882	.04767	.04653	.04542	.04432	.04325	.04219	.04116	.04014
21	.04762	.04644	.04528	.04415	.04303	.04194	.04087	.03981	.03878	.03778
22	.04545	.04427	.04311	.04198	.04086	.03977	.03870	.03766	.03663	.03563
23	.04348	.04229	.04113	.04000	.03889	.03780	.03673	.03569	.03467	.03367
24	.04167	.04048	.03932	.03816	.03707	.03599	.03492	.03389	.03287	.03188
25	.04000	.03881	.03765	.03652	.03541	.03432	.03326	.03223	.03122	.03024
26	.03846	.03727	.03611	.03498	.03387	.03279	.03173	.03070	.02970	.02872
27	.03704	.03585	.03469	.03355	.03245	.03137	.03032	.02929	.02829	.02732
28	.03571	.03452	.03336	.03223	.03112	.03005	.02900	.02798	.02699	.02603
29	.03448	.03329	.03213	.03100	.02990	.02882	.02778	.02676	.02578	.02482
30	.03333	.03214	.03098	.02985	.02875	.02768	.02664	.02563	.02465	.02370
31	.03226	.03106	.02990	.02877	.02768	.02661	.02557	.02457	.02360	.02265
32	.03125	.03006	.02889	.02777	.02667	.02561	.02458	.02358	.02261	.02167
33	.03030	.02911	.02795	.02682	.02573	.02467	.02364	.02265	.02169	.02076
34	.02941	.02822	.02706	.02593	.02484	.02378	.02276	.02177	.02082	.01990
35	.02857	.02738	.02622	.02509	.02400	.02295	.02193	.02095	.02000	.01909
36	.02778	.02658	.02542	.02430	.02321	.02217	.02115	.02018	.01923	.01833
37	.02703	.02583	.02467	.02355	.02247	.02142	.02041	.01944	.01851	.01761
38	.02632	.02512	.02396	.02284	.02176	.02072	.01972	.01875	.01782	.01693
39	.02564	.02444	.02329	.02217	.02109	.02005	.01905	.01809	.01717	.01629
40	.02500	.02380	.02265	.02153	.02046	.01942	.01843	.01747	.01656	.01568
41	.02439	.02319	.02204	.02092	.01985	.01882	.01783	.01688	.01597	.01510
42	.02381	.02261	.02146	.02034	.01928	.01825	.01726	.01632	.01542	.01455
43	.02326	.02206	.02090	.01979	.01873	.01770	.01672	.01579	.01489	.01403
44	.02273	.02153	.02038	.01927	.01820	.01719	.01621	.01528	.01439	.01354
45	.02222	.02102	.01987	.01877	.01771	.01669	.01572	.01479	.01391	.01307
46	.02174	.02054	.01939	.01828	.01723	.01622	.01525	.01433	.01345	.01262
47	.02128	.02008	.01893	.01783	.01677	.01576	.01480	.01389	.01302	.01219
48	.02083	.01963	.01849	.01739	.01633	.01533	.01438	.01347	.01260	.01178
49	.02041	.01921	.01806	.01696	.01591	.01492	.01396	.01306	.01220	.01139
50	.02000	.01880	.01765	.01656	.01551	.01452	.01357	.01267	.01182	.01102

SINKING FUND DEPOSIT FACTOR

INTEREST RATE
(% PER YEAR)

DEPRECIATION PERIOD

YEARS	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75
3	.32514	.32433	.32353	.32273	.32193	.32114	.32035	.31956	.31877	.31799
4	.24082	.23992	.23903	.23814	.23725	.23637	.23549	.23462	.23374	.23288
5	.19025	.18930	.18835	.18742	.18648	.18555	.18463	.18371	.18279	.18188
6	.15655	.15557	.15460	.15363	.15267	.15171	.15076	.14982	.14888	.14795
7	.13250	.13150	.13051	.12952	.12854	.12757	.12661	.12565	.12470	.12376
8	.11447	.11346	.11246	.11146	.11048	.10950	.10853	.10756	.10661	.10566
9	.10046	.09944	.09843	.09744	.09645	.09547	.09449	.09353	.09257	.09163
10	.08926	.08624	.08723	.08623	.08524	.08426	.08329	.08233	.08138	.08044
11	.08011	.07909	.07808	.07708	.07609	.07512	.07415	.07319	.07225	.07131
12	.07249	.07147	.07046	.06947	.06848	.06751	.06655	.06560	.06467	.06374
13	.06605	.06503	.06403	.06304	.06206	.06110	.06014	.05920	.05828	.05736
14	.06054	.05952	.05853	.05754	.05657	.05561	.05467	.05374	.05282	.05192
15	.05577	.05476	.05377	.05279	.05183	.05088	.04994	.04902	.04811	.04722
16	.05160	.05060	.04961	.04864	.04768	.04674	.04582	.04491	.04402	.04314
17	.04793	.04693	.04595	.04499	.04404	.04311	.04220	.04130	.04042	.03955
18	.04467	.04368	.04271	.04175	.04082	.03990	.03899	.03811	.03724	.03638
19	.04176	.04078	.03981	.03887	.03794	.03703	.03614	.03526	.03441	.03357
20	.03915	.03817	.03722	.03628	.03536	.03446	.03358	.03272	.03188	.03105
21	.03679	.03582	.03487	.03394	.03304	.03215	.03128	.03043	.02960	.02879
22	.03465	.03369	.03275	.03183	.03093	.03006	.02920	.02836	.02755	.02675
23	.03270	.03174	.03081	.02991	.02902	.02815	.02731	.02649	.02568	.02490
24	.03091	.02997	.02905	.02815	.02727	.02642	.02559	.02478	.02399	.02322
25	.02928	.02834	.02743	.02654	.02567	.02483	.02401	.02321	.02244	.02169
26	.02777	.02684	.02594	.02506	.02421	.02337	.02257	.02178	.02102	.02028
27	.02638	.02546	.02456	.02370	.02285	.02203	.02124	.02047	.01972	.01899
28	.02509	.02418	.02329	.02244	.02160	.02080	.02001	.01925	.01852	.01781
29	.02389	.02299	.02211	.02127	.02045	.01965	.01888	.01814	.01741	.01672
30	.02278	.02188	.02102	.02018	.01937	.01859	.01783	.01710	.01639	.01571
31	.02174	.02085	.02000	.01917	.01837	.01760	.01686	.01614	.01544	.01478
32	.02077	.01989	.01905	.01823	.01744	.01668	.01595	.01524	.01456	.01391
33	.01986	.01899	.01816	.01735	.01657	.01582	.01510	.01441	.01374	.01310
34	.01901	.01815	.01732	.01653	.01576	.01502	.01431	.01363	.01298	.01236
35	.01821	.01736	.01654	.01575	.01500	.01427	.01358	.01291	.01227	.01166
36	.01745	.01661	.01580	.01503	.01428	.01357	.01289	.01223	.01161	.01101
37	.01674	.01591	.01511	.01435	.01361	.01291	.01224	.01160	.01098	.01040
38	.01607	.01525	.01446	.01370	.01298	.01229	.01163	.01100	.01040	.00983
39	.01544	.01462	.01384	.01310	.01239	.01171	.01106	.01044	.00986	.00930
40	.01484	.01403	.01326	.01253	.01183	.01116	.01052	.00992	.00934	.00880
41	.01427	.01347	.01271	.01199	.01130	.01064	.01002	.00942	.00886	.00833
42	.01373	.01294	.01219	.01148	.01080	.01015	.00954	.00896	.00841	.00789
43	.01322	.01244	.01170	.01099	.01033	.00969	.00909	.00852	.00798	.00747
44	.01273	.01196	.01123	.01054	.00988	.00925	.00866	.00811	.00758	.00708
45	.01227	.01151	.01079	.01010	.00945	.00884	.00826	.00772	.00720	.00672
46	.01183	.01107	.01036	.00969	.00905	.00845	.00788	.00735	.00684	.00637
47	.01141	.01066	.00996	.00930	.00867	.00808	.00752	.00700	.00651	.00605
48	.01101	.01027	.00958	.00892	.00831	.00773	.00718	.00667	.00619	.00574
49	.01062	.00990	.00921	.00857	.00796	.00739	.00686	.00636	.00589	.00545
50	.01026	.00954	.00887	.00823	.00763	.00707	.00655	.00606	.00560	.00517

SINKING FUND DEPOSIT FACTOR

INTEREST RATE
(% PER YEAR)

DEPRECIATION PERIOD

YEARS	5.00	5.25	5.50	5.75	6.00	6.25	6.50	6.75	7.00	7.25
3	.31721	.31643	.31565	.31488	.31411	.31334	.31258	.31181	.31105	.31029
4	.23201	.23115	.23029	.22944	.22859	.22775	.22690	.22606	.22523	.22440
5	.16097	.18007	.17918	.17828	.17740	.17651	.17563	.17476	.17389	.17303
6	.14702	.14610	.14518	.14427	.14336	.14246	.14157	.14068	.13980	.13892
7	.12282	.12189	.12096	.12005	.11914	.11823	.11733	.11644	.11555	.11467
8	.10472	.10379	.10286	.10195	.10104	.10013	.09924	.09835	.09747	.09659
9	.09069	.08976	.08884	.08793	.08702	.08613	.08524	.08436	.08349	.08262
10	.07950	.07858	.07767	.07676	.07587	.07498	.07410	.07324	.07238	.07153
11	.07039	.06947	.06857	.06768	.06679	.06592	.06506	.06420	.06336	.06252
12	.06283	.06192	.06103	.06015	.05928	.05842	.05757	.05673	.05590	.05508
13	.05646	.05556	.05468	.05382	.05296	.05212	.05128	.05046	.04965	.04885
14	.05102	.05015	.04928	.04843	.04758	.04676	.04594	.04514	.04434	.04357
15	.04634	.04548	.04463	.04379	.04296	.04215	.04135	.04057	.03979	.03903
16	.04227	.04142	.04058	.03976	.03895	.03816	.03738	.03661	.03586	.03512
17	.03870	.03786	.03704	.03624	.03544	.03467	.03391	.03316	.03243	.03171
18	.03555	.03473	.03392	.03313	.03236	.03160	.03085	.03013	.02941	.02871
19	.03275	.03194	.03115	.03038	.02962	.02888	.02816	.02745	.02675	.02607
20	.03024	.02945	.02868	.02792	.02718	.02646	.02576	.02507	.02439	.02373
21	.02800	.02722	.02646	.02573	.02500	.02430	.02361	.02294	.02229	.02165
22	.02597	.02521	.02447	.02375	.02305	.02236	.02169	.02104	.02041	.01979
23	.02414	.02339	.02267	.02196	.02128	.02061	.01996	.01933	.01871	.01812
24	.02247	.02174	.02104	.02035	.01968	.01903	.01840	.01778	.01719	.01661
25	.02095	.02024	.01955	.01888	.01823	.01759	.01698	.01639	.01581	.01525
26	.01956	.01887	.01819	.01754	.01690	.01629	.01569	.01512	.01456	.01402
27	.01829	.01761	.01695	.01631	.01570	.01510	.01452	.01396	.01343	.01290
28	.01712	.01646	.01581	.01519	.01459	.01401	.01345	.01291	.01239	.01189
29	.01605	.01540	.01477	.01416	.01358	.01302	.01247	.01195	.01145	.01096
30	.01505	.01442	.01381	.01322	.01265	.01210	.01158	.01107	.01059	.01012
31	.01413	.01351	.01292	.01234	.01179	.01126	.01075	.01027	.00980	.00935
32	.01328	.01268	.01210	.01154	.01100	.01049	.01000	.00952	.00907	.00864
33	.01249	.01190	.01133	.01079	.01027	.00978	.00930	.00884	.00841	.00799
34	.01176	.01118	.01063	.01010	.00960	.00912	.00866	.00822	.00780	.00740
35	.01107	.01051	.00997	.00946	.00897	.00851	.00806	.00764	.00723	.00685
36	.01043	.00989	.00937	.00887	.00839	.00794	.00751	.00710	.00672	.00635
37	.00984	.00931	.00880	.00832	.00786	.00742	.00701	.00661	.00624	.00588
38	.00928	.00877	.00827	.00780	.00736	.00694	.00653	.00615	.00580	.00545
39	.00876	.00826	.00778	.00733	.00689	.00649	.00610	.00573	.00539	.00506
40	.00828	.00779	.00732	.00688	.00646	.00607	.00569	.00534	.00501	.00470
41	.00782	.00734	.00689	.00646	.00606	.00568	.00532	.00498	.00466	.00436
42	.00739	.00693	.00649	.00607	.00568	.00532	.00497	.00464	.00434	.00405
43	.00699	.00654	.00611	.00571	.00533	.00498	.00464	.00433	.00404	.00376
44	.00662	.00618	.00576	.00537	.00501	.00466	.00434	.00404	.00376	.00349
45	.00626	.00583	.00543	.00505	.00470	.00437	.00406	.00377	.00350	.00325
46	.00593	.00551	.00512	.00476	.00441	.00410	.00380	.00352	.00326	.00302
47	.00561	.00521	.00483	.00448	.00415	.00384	.00355	.00329	.00304	.00281
48	.00532	.00493	.00456	.00422	.00390	.00360	.00333	.00307	.00283	.00261
49	.00504	.00466	.00430	.00397	.00366	.00338	.00311	.00287	.00264	.00243
50	.00478	.00441	.00406	.00374	.00344	.00317	.00291	.00268	.00246	.00226

SINKING FUND DEPOSIT FACTOR

DEPRECIATION PERIOD

YEARS	INTEREST RATE (% PER YEAR) 7.50	7.75	8.00	8.25	8.50	8.75	9.00	9.25	9.50	9.75
3	.30954	.30878	.30803	.30729	.30654	.30580	.30505	.30432	.30358	.30285
4	.22357	.22274	.22192	.22110	.22029	.21948	.21867	.21786	.21706	.21627
5	.17216	.17131	.17046	.16961	.16877	.16793	.16709	.16626	.16544	.16461
6	.13804	.13718	.13632	.13546	.13461	.13376	.13292	.13208	.13125	.13043
7	.11380	.11293	.11207	.11122	.11037	.10953	.10869	.10786	.10704	.10622
8	.09573	.09487	.09401	.09317	.09233	.09150	.09067	.08986	.08905	.08824
9	.08177	.08092	.08008	.07925	.07842	.07761	.07680	.07600	.07520	.07442
10	.07069	.06985	.06903	.06821	.06741	.06661	.06582	.06504	.06427	.06350
11	.06170	.06088	.06008	.05928	.05849	.05772	.05695	.05619	.05544	.05470
12	.05426	.05348	.05270	.05192	.05115	.05040	.04965	.04891	.04819	.04747
13	.04806	.04729	.04652	.04577	.04502	.04429	.04357	.04285	.04215	.04146
14	.04280	.04204	.04130	.04056	.03984	.03913	.03843	.03775	.03707	.03640
15	.03829	.03755	.03683	.03612	.03542	.03473	.03406	.03340	.03274	.03210
16	.03439	.03368	.03298	.03229	.03161	.03095	.03030	.02966	.02903	.02842
17	.03100	.03031	.02963	.02896	.02831	.02767	.02705	.02643	.02583	.02524
18	.02803	.02736	.02670	.02606	.02543	.02481	.02421	.02362	.02305	.02248
19	.02541	.02476	.02413	.02351	.02290	.02231	.02173	.02117	.02061	.02007
20	.02309	.02246	.02185	.02125	.02067	.02010	.01955	.01900	.01848	.01796
21	.02103	.02042	.01983	.01926	.01870	.01815	.01762	.01710	.01659	.01610
22	.01919	.01860	.01803	.01748	.01694	.01641	.01591	.01541	.01493	.01446
23	.01754	.01697	.01642	.01589	.01537	.01487	.01438	.01391	.01345	.01300
24	.01605	.01551	.01498	.01447	.01397	.01349	.01302	.01257	.01213	.01171
25	.01471	.01419	.01368	.01319	.01271	.01225	.01181	.01138	.01096	.01056
26	.01350	.01299	.01251	.01204	.01158	.01114	.01072	.01031	.00991	.00953
27	.01240	.01192	.01145	.01100	.01056	.01014	.00973	.00934	.00897	.00861
28	.01141	.01094	.01049	.01006	.00964	.00924	.00885	.00848	.00812	.00778
29	.01050	.01005	.00962	.00920	.00881	.00842	.00806	.00770	.00736	.00704
30	.00967	.00924	.00883	.00843	.00805	.00769	.00734	.00700	.00668	.00637
31	.00892	.00850	.00811	.00773	.00737	.00702	.00669	.00637	.00606	.00577
32	.00823	.00783	.00745	.00709	.00674	.00641	.00610	.00579	.00551	.00523
33	.00759	.00721	.00685	.00651	.00618	.00586	.00556	.00528	.00500	.00475
34	.00701	.00665	.00630	.00597	.00566	.00536	.00508	.00481	.00455	.00431
35	.00646	.00613	.00580	.00549	.00519	.00491	.00464	.00438	.00414	.00391
36	.00599	.00566	.00534	.00504	.00476	.00449	.00424	.00399	.00376	.00355
37	.00555	.00523	.00492	.00464	.00437	.00411	.00387	.00364	.00343	.00322
38	.00513	.00483	.00454	.00427	.00401	.00377	.00354	.00332	.00312	.00293
39	.00475	.00446	.00419	.00393	.00368	.00345	.00324	.00303	.00284	.00266
40	.00440	.00412	.00386	.00361	.00338	.00316	.00296	.00277	.00259	.00242
41	.00406	.00381	.00356	.00333	.00311	.00290	.00271	.00253	.00236	.00220
42	.00376	.00352	.00329	.00306	.00286	.00266	.00248	.00231	.00215	.00200
43	.00350	.00326	.00303	.00282	.00263	.00244	.00227	.00211	.00196	.00182
44	.00325	.00302	.00280	.00260	.00241	.00224	.00208	.00193	.00178	.00165
45	.00301	.00279	.00259	.00240	.00222	.00205	.00190	.00176	.00163	.00150
46	.00279	.00258	.00239	.00221	.00204	.00189	.00174	.00161	.00148	.00137
47	.00259	.00239	.00221	.00204	.00188	.00173	.00160	.00147	.00135	.00125
48	.00241	.00222	.00204	.00188	.00173	.00159	.00146	.00134	.00123	.00113
49	.00223	.00205	.00189	.00173	.00159	.00146	.00134	.00123	.00113	.00103
50	.00207	.00190	.00174	.00160	.00146	.00134	.00123	.00112	.00103	.00094

SINKING FUND DEPOSIT FACTOR

INTEREST RATE
(% PER YEAR)

DEPRECIATION PERIOD

YEARS	10.00	10.25	10.50	10.75	11.00	11.25	11.50	11.75	12.00	12.25
3	.30211	.30139	.30066	.29994	.29921	.29849	.29778	.29706	.29635	.29564
4	.21547	.21468	.21389	.21311	.21233	.21155	.21077	.21000	.20923	.20847
5	.16380	.16298	.16218	.16137	.16057	.15977	.15898	.15819	.15741	.15663
6	.12961	.12879	.12798	.12718	.12638	.12558	.12479	.12401	.12323	.12245
7	.10541	.10460	.10380	.10300	.10222	.10143	.10066	.09988	.09912	.09836
8	.08744	.08665	.08587	.08509	.08432	.08356	.08280	.08205	.08130	.08056
9	.07364	.07287	.07211	.07135	.07060	.06986	.06913	.06840	.06768	.06697
10	.06275	.06200	.06126	.06053	.05980	.05909	.05838	.05768	.05698	.05630
11	.05396	.05324	.05252	.05182	.05112	.05043	.04975	.04908	.04842	.04776
12	.04676	.04607	.04538	.04470	.04403	.04337	.04271	.04207	.04144	.04081
13	.04076	.04011	.03945	.03879	.03815	.03752	.03690	.03628	.03568	.03508
14	.03575	.03510	.03447	.03384	.03323	.03262	.03203	.03145	.03087	.03031
15	.03147	.03086	.03025	.02965	.02907	.02849	.02792	.02737	.02682	.02629
16	.02782	.02722	.02664	.02608	.02552	.02497	.02443	.02391	.02339	.02288
17	.02466	.02410	.02354	.02300	.02247	.02195	.02144	.02094	.02046	.01998
18	.02193	.02139	.02086	.02035	.01984	.01935	.01887	.01840	.01794	.01749
19	.01955	.01903	.01853	.01804	.01756	.01710	.01664	.01620	.01576	.01534
20	.01746	.01697	.01649	.01603	.01558	.01513	.01470	.01429	.01388	.01348
21	.01562	.01516	.01471	.01427	.01384	.01342	.01302	.01262	.01224	.01187
22	.01401	.01356	.01313	.01272	.01231	.01192	.01154	.01117	.01081	.01046
23	.01257	.01215	.01175	.01135	.01097	.01060	.01024	.00990	.00956	.00923
24	.01130	.01090	.01052	.01015	.00979	.00944	.00910	.00878	.00846	.00816
25	.01017	.00979	.00943	.00908	.00874	.00841	.00810	.00779	.00750	.00722
26	.00916	.00880	.00846	.00813	.00781	.00751	.00721	.00693	.00665	.00639
27	.00826	.00792	.00760	.00729	.00699	.00670	.00643	.00616	.00590	.00566
28	.00745	.00713	.00683	.00654	.00626	.00599	.00573	.00548	.00524	.00502
29	.00673	.00643	.00614	.00587	.00561	.00535	.00511	.00488	.00466	.00445
30	.00608	.00580	.00553	.00527	.00502	.00479	.00456	.00435	.00414	.00395
31	.00550	.00523	.00498	.00474	.00451	.00429	.00408	.00388	.00369	.00350
32	.00497	.00472	.00448	.00426	.00404	.00384	.00364	.00346	.00328	.00311
33	.00450	.00427	.00404	.00383	.00363	.00344	.00326	.00308	.00292	.00276
34	.00407	.00385	.00364	.00345	.00326	.00308	.00291	.00275	.00260	.00246
35	.00369	.00348	.00329	.00310	.00293	.00276	.00260	.00246	.00232	.00218
36	.00334	.00315	.00297	.00279	.00263	.00248	.00233	.00219	.00206	.00194
37	.00303	.00285	.00268	.00252	.00236	.00222	.00209	.00196	.00184	.00173
38	.00275	.00258	.00242	.00227	.00213	.00199	.00187	.00175	.00164	.00154
39	.00249	.00233	.00218	.00204	.00191	.00179	.00167	.00156	.00146	.00137
40	.00226	.00211	.00197	.00184	.00172	.00160	.00150	.00140	.00130	.00122
41	.00205	.00191	.00178	.00166	.00155	.00144	.00134	.00125	.00116	.00108
42	.00186	.00173	.00161	.00150	.00139	.00129	.00120	.00112	.00104	.00096
43	.00169	.00157	.00145	.00135	.00125	.00116	.00108	.00100	.00092	.00086
44	.00153	.00142	.00131	.00122	.00113	.00104	.00096	.00089	.00083	.00076
45	.00139	.00129	.00119	.00110	.00101	.00094	.00086	.00080	.00074	.00068
46	.00126	.00116	.00107	.00099	.00091	.00084	.00077	.00071	.00066	.00060
47	.00115	.00106	.00097	.00089	.00082	.00076	.00069	.00064	.00059	.00054
48	.00104	.00096	.00088	.00081	.00074	.00068	.00062	.00057	.00052	.00048
49	.00095	.00087	.00079	.00073	.00067	.00061	.00056	.00051	.00047	.00043
50	.00086	.00079	.00072	.00066	.00060	.00055	.00050	.00046	.00042	.00038

APPENDIX C

VALUES OF ANNUAL DEPRECIATION RATE

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                         DEPRECIATION  SCHEDULES-- 3  YEAR  LIFETIME

         :  STRAIGHT  LINE    : DOUBLE  DECLINING :  SUM  OF  DIGITS    : DOUBLE  DECLINING :
         :                    :                   :                     :  /STRAIGHT  LINE  :
  YEAR   : %/YEAR :  CUMULA-  : %/YEAR :  CUMULA- : %/YEAR :   CUMULA-  : %/YEAR :  CUMULA- :
         :        :  TIVE %   :        :  TIVE %  :        :   TIVE %   :        :  TIVE %  :
-----------------------------------------------------------------------------------------------
   1     :  33.33     33.33   :  66.67     66.67  :  50.00      50.00   :  66.67     66.67  :
   2     :  33.33     66.67   :  22.22     88.89  :  33.33      83.33   :  22.22     88.89  :
   3     :  33.33    100.00   :   7.41     96.30  :  16.67     100.00   :  11.11    100.00  :
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                               DEPRECIATION  SCHEDULES-- 4  YEAR  LIFETIME

        :  STRAIGHT  LINE    : DOUBLE  DECLINING :  SUM  OF  DIGITS   : DOUBLE  DECLINING :
        :                    :                   :                    :  /STRAIGHT  LINE  :
 YEAR   : %/YEAR :  CUMULA-  : %/YEAR :  CUMULA- : %/YEAR :  CUMULA-  : %/YEAR :  CUMULA- :
        :        :  TIVE %   :        :  TIVE %  :        :  TIVE %   :        :  TIVE %  :
-----------------------------------------------------------------------------------------
   1    :  25.00     25.00   :  50.00     50.00  :  40.00     40.00   :  50.00     50.00  :
   2    :  25.00     50.00   :  25.00     75.00  :  30.00     70.00   :  25.00     75.00  :
   3    :  25.00     75.00   :  12.50     87.50  :  20.00     90.00   :  12.50     87.50  :
   4    :  25.00    100.00   :   6.25     93.75  :  10.00    100.00   :  12.50    100.00  :
```

DEPRECIATION SCHEDULES-- 5 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %
1	20.00	20,00	40,00	40,00	33.33	33.33	40.00	40.00
2	20.00	40,00	24.00	64.00	26.67	60.00	24.00	64.00
3	20.00	60,00	14.40	78.40	20.00	80.00	14.40	78.40
4	20.00	80,00	8.64	87.04	13.33	93.33	10.80	89.20
5	20.00	100,00	5.18	92,22	6.67	100.00	10.80	100.00

DEPRECIATION SCHEDULES-- 6 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %
1	16.67	16.67	33.33	33.33	28.57	28.57	33.33	33.33
2	16.67	33.33	22.22	55.56	23.81	52.38	22.22	55.56
3	16.67	50.00	14.81	70.37	19.05	71.43	14.81	70.37
4	16.67	66.67	9.88	80.25	14.29	85.71	9.88	80.25
5	16.67	83.33	6.58	86.83	9.52	95.24	9.88	90.12
6	16.67	100.00	4.39	91.22	4.76	100.00	9.88	100.00

DEPRECIATION SCHEDULES-- 7 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %
1	14.29	14.29	28.57	28.57	25.00	25.00	28.57	28.57
2	14.29	28.57	20.41	48.98	21.43	46.43	20.41	48.98
3	14.29	42.86	14.58	63.56	17.86	64.29	14.58	63.56
4	14.29	57.14	10.41	73.97	14.29	78.57	10.41	73.97
5	14.29	71.43	7.44	81.41	10.71	89.29	8.68	82.65
6	14.29	85.71	5.31	86.72	7.14	96.43	8.68	91.32
7	14.29	100.00	3.79	90.51	3.57	100.00	8.68	100.00

DEPRECIATION SCHEDULES-- 8 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %
1	12.50	12.50	25.00	25.00	22.22	22.22	25.00	25.00
2	12.50	25.00	18.75	43.75	19.44	41.67	18.75	43.75
3	12.50	37.50	14.06	57.81	16.67	58.33	14.06	57.81
4	12.50	50.00	10.55	68.36	13.89	72.22	10.55	68.36
5	12.50	62.50	7.91	76.27	11.11	83.33	7.91	76.27
6	12.50	75.00	5.93	82.20	8.33	91.67	7.91	84.18
7	12.50	87.50	4.45	86.65	5.56	97.22	7.91	92.09
8	12.50	100.00	3.34	89.99	2.78	100.00	7.91	100.00

DEPRECIATION SCHEDULES-- 9 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %
1	11.11	11,11	22.22	22,22	20.00	20.00	22.22	22.22
2	11.11	22,22	17.28	39.51	17.78	37.78	17.28	39.51
3	11.11	33,33	13.44	52.95	15.56	53.33	13.44	52.95
4	11.11	44,44	10.46	63.40	13.33	66.67	10.46	63.40
5	11.11	55,56	8.13	71.54	11.11	77.78	8.13	71.54
6	11.11	66,67	6.33	77.86	8.89	86.67	7.12	78.65
7	11.11	77,78	4.92	82.78	6.67	93.33	7.12	85.77
8	11.11	88,89	3.83	86.61	4.44	97.78	7.12	92.88
9	11.11	100,00	2,98	89.58	2.22	100.00	7.12	100.00

```
                          DEPRECIATION  SCHEDULES--10  YEAR  LIFETIME

       :  STRAIGHT  LINE    : DOUBLE  DECLINING :  SUM  OF  DIGITS  : DOUBLE  DECLINING :
       :                    :                   :                   :  /STRAIGHT  LINE  :
YEAR   : %/YEAR :  CUMULA-  : %/YEAR :  CUMULA- : %/YEAR :  CUMULA- : %/YEAR :  CUMULA- :
       :        :  TIVE %   :        :  TIVE %  :        :  TIVE %  :        :  TIVE %  :
----------------------------------------------------------------------------------------
  1    : 10.00      10.00   : 20.00     20.00   : 18.18     18.18   : 20.00     20.00   :
  2    : 10.00      20.00   : 16.00     36.00   : 16.36     34.55   : 16.00     36.00   :
  3    : 10.00      30.00   : 12.80     48.80   : 14.55     49.09   : 12.80     48.80   :
  4    : 10.00      40.00   : 10.24     59.04   : 12.73     61.82   : 10.24     59.04   :
  5    : 10.00      50.00   :  8.19     67.23   : 10.91     72.73   :  8.19     67.23   :
       :                    :                   :                   :                   :
  6    : 10.00      60.00   :  6.55     73.79   :  9.09     81.82   :  6.55     73.79   :
  7    : 10.00      70.00   :  5.24     79.03   :  7.27     89.09   :  6.55     80.34   :
  8    : 10.00      80.00   :  4.19     83.22   :  5.45     94.55   :  6.55     86.89   :
  9    : 10.00      90.00   :  3.36     86.58   :  3.64     98.18   :  6.55     93.45   :
 10    : 10.00     100.00   :  2.68     89.26   :  1.82    100.00   :  6.55    100.00   :
```

DEPRECIATION SCHEDULES--11 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %
1	9.09	9.09	18.18	18.18	16.67	16.67	18.18	18.18
2	9.09	18.18	14.88	33.06	15.15	31.82	14.88	33.06
3	9.09	27.27	12.17	45.23	13.64	45.45	12.17	45.23
4	9.09	36.36	9.96	55.19	12.12	57.58	9.96	55.19
5	9.09	45.45	8.15	63.34	10.61	68.18	8.15	63.34
6	9.09	54.55	6.67	70.00	9.09	77.27	6.67	70.00
7	9.09	63.64	5.45	75.46	7.58	84.85	6.00	76.00
8	9.09	72.73	4.46	79.92	6.06	90.91	6.00	82.00
9	9.09	81.82	3.65	83.57	4.55	95.45	6.00	88.00
10	9.09	90.91	2.99	86.56	3.03	98.48	6.00	94.00
11	9.09	100.00	2.44	89.00	1.52	100.00	6.00	100.00

DEPRECIATION SCHEDULES--12 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULA- TIVE %	%/YEAR	CUMULA- TIVE %	%/YEAR	CUMULA- TIVE %	%/YEAR	CUMULA- TIVE %
1	8.33	8.33	16.67	16.67	15.38	15.38	16.67	16.67
2	8.33	16.67	13.89	30.56	14.10	29.49	13.89	30.56
3	8.33	25.00	11.57	42.13	12.82	42.31	11.57	42.13
4	8.33	33.33	9.65	51.77	11.54	53.85	9.65	51.77
5	8.33	41.67	8.04	59.81	10.26	64.10	8.04	59.81
6	8.33	50.00	6.70	66.51	8.97	73.08	6.70	66.51
7	8.33	58.33	5.58	72.09	7.69	80.77	5.58	72.09
8	8.33	66.67	4.65	76.74	6.41	87.18	5.58	77.67
9	8.33	75.00	3.88	80.62	5.13	92.31	5.58	83.26
10	8.33	83.33	3.23	63.85	3.85	96.15	5.58	88.84
11	8.33	91.67	2.69	86.54	2.56	98.72	5.58	94.42
12	8.33	100.00	2.24	88.78	1.28	100.00	5.58	100.00

DEPRECIATION SCHEDULES--13 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %
1	7.69	7.69	15.38	15.38	14.29	14.29	15.38	15.38
2	7.69	15.38	13.02	28.40	13.19	27.47	13.02	28.40
3	7.69	23.08	11.02	39.42	12.09	39.56	11.02	39.42
4	7.69	30.77	9.32	48.74	10.99	50.55	9.32	48.74
5	7.69	38.46	7.89	56.62	9.89	60.44	7.89	56.62
6	7.69	46.15	6.67	63.30	8.79	69.23	6.67	63.30
7	7.69	53.85	5.65	68.94	7.69	76.92	5.65	68.94
8	7.69	61.54	4.78	73.72	6.59	83.52	5.18	74.12
9	7.69	69.23	4.04	77.76	5.49	89.01	5.18	79.30
10	7.69	76.92	3.42	81.19	4.40	93.41	5.18	84.47
11	7.69	84.62	2.89	84.08	3.30	96.70	5.18	89.65
12	7.69	92.31	2.45	86.53	2.20	98.90	5.18	94.82
13	7.69	100.00	2.07	88.60	1.10	100.00	5.18	100.00

DEPRECIATION SCHEDULES--14 YEAR LIFETIME

YEAR	STRAIGHT LINE %/YEAR	STRAIGHT LINE CUMULATIVE %	DOUBLE DECLINING %/YEAR	DOUBLE DECLINING CUMULATIVE %	SUM OF DIGITS %/YEAR	SUM OF DIGITS CUMULATIVE %	DOUBLE DECLINING /STRAIGHT LINE %/YEAR	DOUBLE DECLINING /STRAIGHT LINE CUMULATIVE %
1	7.14	7.14	14.29	14.29	13.33	13.33	14.29	14.29
2	7.14	14.29	12.24	26.53	12.38	25.71	12.24	26.53
3	7.14	21.43	10.50	37.03	11.43	37.14	10.50	37.03
4	7.14	28.57	9.00	46.02	10.48	47.62	9.00	46.02
5	7.14	35.71	7.71	53.73	9.52	57.14	7.71	53.73
6	7.14	42.86	6.61	60.34	8.57	65.71	6.61	60.34
7	7.14	50.00	5.67	66.01	7.62	73.33	5.67	66.01
8	7.14	57.14	4.86	70.86	6.67	80.00	4.86	70.86
9	7.14	64.29	4.16	75.03	5.71	85.71	4.86	75.72
10	7.14	71.43	3.57	78.59	4.76	90.48	4.86	80.58
11	7.14	78.57	3.06	81.65	3.81	94.29	4.86	85.43
12	7.14	85.71	2.62	84.27	2.86	97.14	4.86	90.29
13	7.14	92.86	2.25	86.52	1.90	99.05	4.86	95.14
14	7.14	100.00	1.93	88.45	.95	100.00	4.86	100.00

DEPRECIATION SCHEDULES--15 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %
1	6.67	6.67	13.33	13.33	12.50	12.50	13.33	13.33
2	6.67	13.33	11.56	24.89	11.67	24.17	11.56	24.89
3	6.67	20.00	10.01	34.90	10.83	35.00	10.01	34.90
4	6.67	26.67	8.68	43.58	10.00	45.00	8.68	43.58
5	6.67	33.33	7.52	51.11	9.17	54.17	7.52	51.11
6	6.67	40.00	6.52	57.62	8.33	62.50	6.52	57.62
7	6.67	46.67	5.65	63.27	7.50	70.00	5.65	63.27
8	6.67	53.33	4.90	68.17	6.67	76.67	4.90	68.17
9	6.67	60.00	4.24	72.42	5.83	82.50	4.55	72.72
10	6.67	66.67	3.68	76.09	5.00	87.50	4.55	77.27
11	6.67	73.33	3.19	79.28	4.17	91.67	4.55	81.81
12	6.67	80.00	2.76	82.04	3.33	95.00	4.55	86.36
13	6.67	86.67	2.39	84.44	2.50	97.50	4.55	90.91
14	6.67	93.33	2.07	86.51	1.67	99.17	4.55	95.45
15	6.67	100.00	1.80	88.31	.83	100.00	4.55	100.00

DEPRECIATION SCHEDULES--16 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %
1	6.25	6.25	12.50	12.50	11.76	11.76	12.50	12.50
2	6.25	12.50	10.94	23.44	11.03	22.79	10.94	23.44
3	6.25	18.75	9.57	33.01	10.29	33.09	9.57	33.01
4	6.25	25.00	8.37	41.38	9.56	42.65	8.37	41.38
5	6.25	31.25	7.33	48.71	8.82	51.47	7.33	48.71
6	6.25	37.50	6.41	55.12	8.09	59.56	6.41	55.12
7	6.25	43.75	5.61	60.73	7.35	66.91	5.61	60.73
8	6.25	50.00	4.91	65.64	6.62	73.53	4.91	65.64
9	6.25	56.25	4.30	69.93	5.88	79.41	4.30	69.93
10	6.25	62.50	3.76	73.69	5.15	84.56	4.30	74.23
11	6.25	68.75	3.29	76.98	4.41	88.97	4.30	78.52
12	6.25	75.00	2.88	79.86	3.68	92.65	4.30	82.82
13	6.25	81.25	2.52	82.38	2.94	95.59	4.30	87.11
14	6.25	87.50	2.20	84.58	2.21	97.79	4.30	91.41
15	6.25	93.75	1.93	86.51	1.47	99.26	4.30	95.70
16	6.25	100.00	1.69	88.19	.74	100.00	4.30	100.00

DEPRECIATION SCHEDULES--17 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %
1	5.88	5.88	11.76	11.76	11.11	11.11	11.76	11.76
2	5.88	11.76	10.38	22.15	10.46	21.57	10.38	22.15
3	5.88	17.65	9.16	31.30	9.80	31.37	9.16	31.30
4	5.88	23.53	8.08	39.39	9.15	40.52	8.08	39.39
5	5.88	29.41	7.13	46.52	8.50	49.02	7.13	46.52
6	5.88	35.29	6.29	52.81	7.84	56.86	6.29	52.81
7	5.88	41.18	5.55	58.36	7.19	64.05	5.55	58.36
8	5.88	47.06	4.90	63.26	6.54	70.59	4.90	63.26
9	5.88	52.94	4.32	67.58	5.88	76.47	4.32	67.58
10	5.88	58.82	3.81	71.40	5.23	81.70	4.05	71.63
11	5.88	64.71	3.37	74.76	4.58	86.27	4.05	75.69
12	5.88	70.59	2.97	77.73	3.92	90.20	4.05	79.74
13	5.88	76.47	2.62	80.35	3.27	93.46	4.05	83.79
14	5.88	82.35	2.31	82.66	2.61	96.08	4.05	87.84
15	5.88	88.24	2.04	84.70	1.96	98.04	4.05	91.90
16	5.88	94.12	1.80	86.50	1.31	99.35	4.05	95.95
17	5.88	100.00	1.59	88.09	.65	100.00	4.05	100.00

DEPRECIATION SCHEDULES--18 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DFCLINING /STRAIGHT LINE	
	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %
1	5.56	5.56	11.11	11.11	10.53	10.53	11.11	11.11
2	5.56	11.11	9.88	20.99	9.94	20.47	9.88	20.99
3	5.56	16.67	8.78	29.77	9.36	29.82	8.78	29.77
4	5.56	22.22	7.80	37.57	8.77	38.60	7.80	37.57
5	5.56	27.78	6.94	44.51	8.19	46.78	6.94	44.51
6	5.56	33.33	6.17	50.67	7.60	54.39	6.17	50.67
7	5.56	38.89	5.48	56.15	7.02	61.40	5.48	56.15
8	5.56	44.44	4.87	61.03	6.43	67.84	4.87	61.03
9	5.56	50.00	4.33	65.36	5.85	73.68	4.33	65.36
10	5.56	55.56	3.85	69.21	5.26	78.95	3.85	69.21
11	5.56	61.11	3.42	72.63	4.68	83.63	3.85	73.05
12	5.56	66.67	3.04	75.67	4.09	87.72	3.85	76.90
13	5.56	72.22	2.70	78.37	3.51	91.23	3.85	80.75
14	5.56	77.78	2.40	80.78	2.92	94.15	3.85	84.60
15	5.56	83.33	2.14	82.91	2.34	96.49	3.85	88.45
16	5.56	88.89	1.90	84.81	1.75	98.25	3.85	92.30
17	5.56	94.44	1.69	86.50	1.17	99.42	3.85	96.15
18	5.56	100.00	1.50	88.00	.58	100.00	3.85	100.00

DEPRECIATION SCHEDULES--19 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %
1	5.26	5.26	10.53	10.53	10.00	10.00	10.53	10.53
2	5.26	10.53	9.42	19.94	9.47	19.47	9.42	19.94
3	5.26	15.79	8.43	28.37	8.95	28.42	8.43	28.37
4	5.26	21.05	7.54	35.91	8.42	36.84	7.54	35.91
5	5.26	26.32	6.75	42.66	7.89	44.74	6.75	42.66
6	5.26	31.58	6.04	48.69	7.37	52.11	6.04	48.69
7	5.26	36.84	5.40	54.09	6.84	58.95	5.40	54.09
8	5.26	42.11	4.83	58.93	6.32	65.26	4.83	58.93
9	5.26	47.37	4.32	63.25	5.79	71.05	4.32	63.25
10	5.26	52.63	3.87	67.12	5.26	76.32	3.87	67.12
11	5.26	57.89	3.46	70.58	4.74	81.05	3.65	70.77
12	5.26	63.16	3.10	73.68	4.21	85.26	3.65	74.43
13	5.26	68.42	2.77	76.45	3.68	88.95	3.65	78.08
14	5.26	73.68	2.48	78.93	3.16	92.11	3.65	81.73
15	5.26	78.95	2.22	81.14	2.63	94.74	3.65	85.39
16	5.26	84.21	1.98	83.13	2.11	96.84	3.65	89.04
17	5.26	89.47	1.78	84.91	1.58	98.42	3.65	92.69
18	5.26	94.74	1.59	86.49	1.05	99.47	3.65	96.35
19	5.26	100.00	1.42	87.92	.53	100.00	3.65	100.00

DEPRECIATION SCHEDULES--20 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %
1	5.00	5.00	10.00	10.00	9.52	9.52	10.00	10.00
2	5.00	10.00	9.00	19.00	9.05	18.57	9.00	19.00
3	5.00	15.00	8.10	27.10	8.57	27.14	8.10	27.10
4	5.00	20.00	7.29	34.39	8.10	35.24	7.29	34.39
5	5.00	25.00	6.56	40.95	7.62	42.86	6.56	40.95
6	5.00	30.00	5.90	46.86	7.14	50.00	5.90	46.86
7	5.00	35.00	5.31	52.17	6.67	56.67	5.31	52.17
8	5.00	40.00	4.78	56.95	6.19	62.86	4.78	56.95
9	5.00	45.00	4.30	61.26	5.71	68.57	4.30	61.26
10	5.00	50.00	3.87	65.13	5.24	73.81	3.87	65.13
11	5.00	55.00	3.49	68.62	4.76	78.57	3.49	68.62
12	5.00	60.00	3.14	71.76	4.29	82.86	3.49	72.11
13	5.00	65.00	2.82	74.58	3.81	86.67	3.49	75.59
14	5.00	70.00	2.54	77.12	3.33	90.00	3.49	79.08
15	5.00	75.00	2.29	79.41	2.86	92.86	3.49	82.57
16	5.00	80.00	2.06	81.47	2.38	95.24	3.49	86.05
17	5.00	85.00	1.85	83.32	1.90	97.14	3.49	89.54
18	5.00	90.00	1.67	84.99	1.43	98.57	3.49	93.03
19	5.00	95.00	1.50	86.49	.95	99.52	3.49	96.51
20	5.00	100.00	1.35	87.84	.48	100.00	3.49	100.00

DEPRECIATION SCHEDULES--21 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %
1	4.76	4.76	9.52	9.52	9.09	9.09	9.52	9.52
2	4.76	9.52	8.62	18.14	8.66	17.75	8.62	18.14
3	4.76	14.29	7.80	25.94	8.23	25.97	7.80	25.94
4	4.76	19.05	7.05	32.99	7.79	33.77	7.05	32.99
5	4.76	23.81	6.38	39.37	7.36	41.13	6.38	39.37
6	4.76	28.57	5.77	45.15	6.93	48.05	5.77	45.15
7	4.76	33.33	5.22	50.37	6.49	54.55	5.22	50.37
8	4.76	38.10	4.73	55.10	6.06	60.61	4.73	55.10
9	4.76	42.86	4.28	59.37	5.63	66.23	4.28	59.37
10	4.76	47.62	3.87	63.24	5.19	71.43	3.87	63.24
11	4.76	52.38	3.50	66.74	4.76	76.19	3.50	66.74
12	4.76	57.14	3.17	69.91	4.33	80.52	3.33	70.07
13	4.76	61.90	2.87	72.78	3.90	84.42	3.33	73.39
14	4.76	66.67	2.59	75.37	3.46	87.88	3.33	76.72
15	4.76	71.43	2.35	77.71	3.03	90.91	3.33	80.05
16	4.76	76.19	2.12	79.84	2.60	93.51	3.33	83.37
17	4.76	80.95	1.92	81.76	2.16	95.67	3.33	86.70
18	4.76	85.71	1.74	83.49	1.73	97.40	3.33	90.02
19	4.76	90.48	1.57	85.07	1.30	98.70	3.33	93.35
20	4.76	95.24	1.42	86.49	.87	99.57	3.33	96.67
21	4.76	100.00	1.29	87.78	.43	100.00	3.33	100.00

DEPRECIATION SCHEDULES--22 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %
1	4.55	4.55	9.09	9.09	8.70	8.70	9.09	9.09
2	4.55	9.09	8.26	17.36	8.30	17.00	8.26	17.36
3	4.55	13.64	7.51	24.87	7.91	24.90	7.51	24.87
4	4.55	18.18	6.83	31.70	7.51	32.41	6.83	31.70
5	4.55	22.73	6.21	37.91	7.11	39.53	6.21	37.91
6	4.55	27.27	5.64	43.55	6.72	46.25	5.64	43.55
7	4.55	31.82	5.13	48.68	6.32	52.57	5.13	48.68
8	4.55	36.36	4.67	53.35	5.93	58.50	4.67	53.35
9	4.55	40.91	4.24	57.59	5.53	64.03	4.24	57.59
10	4.55	45.45	3.86	61.45	5.14	69.17	3.86	61.45
11	4.55	50.00	3.50	64.95	4.74	73.91	3.50	64.95
12	4.55	54.55	3.19	68.14	4.35	78.26	3.19	68.14
13	4.55	59.09	2.90	71.03	3.95	82.21	3.19	71.32
14	4.55	63.64	2.63	73.67	3.56	85.77	3.19	74.51
15	4.55	68.18	2.39	76.06	3.16	88.93	3.19	77.70
16	4.55	72.73	2.18	78.24	2.77	91.70	3.19	80.88
17	4.55	77.27	1.98	80.22	2.37	94.07	3.19	84.07
18	4.55	81.82	1.80	82.01	1.98	96.05	3.19	87.25
19	4.55	86.36	1.64	83.65	1.58	97.63	3.19	90.44
20	4.55	90.91	1.49	85.14	1.19	98.81	3.19	93.63
21	4.55	95.45	1.35	86.49	.79	99.60	3.19	96.81
22	4.55	100.00	1.23	87.72	.40	100.00	3.19	100.00

DEPRECIATION SCHEDULES--23 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %
1	4.35	4.35	8.70	8.70	8.33	8.33	8.70	8.70
2	4.35	8.70	7.94	16.64	7.97	16.30	7.94	16.64
3	4.35	13.04	7.25	23.88	7.61	23.91	7.25	23.88
4	4.35	17.39	6.62	30.50	7.25	31.16	6.62	30.50
5	4.35	21.74	6.04	36.55	6.88	38.04	6.04	36.55
6	4.35	26.09	5.52	42.06	6.52	44.57	5.52	42.06
7	4.35	30.43	5.04	47.10	6.16	50.72	5.04	47.10
8	4.35	34.78	4.60	51.70	5.80	56.52	4.60	51.70
9	4.35	39.13	4.20	55.90	5.43	61.96	4.20	55.90
10	4.35	43.48	3.83	59.74	5.07	67.03	3.83	59.74
11	4.35	47.83	3.50	63.24	4.71	71.74	3.50	63.24
12	4.35	52.17	3.20	66.43	4.35	76.09	3.20	66.43
13	4.35	56.52	2.92	69.35	3.99	80.07	3.05	69.49
14	4.35	60.87	2.66	72.02	3.62	83.70	3.05	72.54
15	4.35	65.22	2.43	74.45	3.26	86.96	3.05	75.59
16	4.35	69.57	2.22	76.67	2.90	89.86	3.05	78.64
17	4.35	73.91	2.03	78.70	2.54	92.39	3.05	81.69
18	4.35	78.26	1.85	80.55	2.17	94.57	3.05	84.74
19	4.35	82.61	1.69	82.24	1.81	96.38	3.05	87.79
20	4.35	86.96	1.54	83.79	1.45	97.83	3.05	90.85
21	4.35	91.30	1.41	85.20	1.09	98.91	3.05	93.90
22	4.35	95.65	1.29	86.49	.72	99.64	3.05	96.95
23	4.35	100.00	1.18	87.66	.36	100.00	3.05	100.00

DEPRECIATION SCHEDULES--24 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %
1	4.17	4,17	8.33	8,33	8,00	8,00	8.33	8.33
2	4.17	8,33	7.64	15,97	7,67	15,67	7.64	15.97
3	4.17	12,50	7,00	22,97	7,33	23,00	7.00	22.97
4	4.17	16,67	6.42	29,39	7.00	30,00	6.42	29.39
5	4.17	20,83	5.88	35,28	6,67	36,67	5.88	35.28
6	4.17	25,00	5.39	40,67	6,33	43,00	5.39	40.67
7	4.17	29,17	4.94	45,61	6,00	49,00	4,94	45.61
8	4.17	33,33	4.53	50,15	5,67	54,67	4.53	50.15
9	4.17	37,50	4.15	54,30	5,33	60,00	4.15	54.30
10	4.17	41,67	3.81	58,11	5,00	65,00	3.81	58.11
11	4.17	45,83	3.49	61.60	4,67	69,67	3.49	61.60
12	4.17	50,00	3.20	64.80	4,33	74,00	3.20	64.80
13	4.17	54,17	2.93	67,73	4,00	78,00	2.93	67.73
14	4.17	58,33	2.69	70,42	3,67	81,67	2.93	70.67
15	4.17	62,50	2.46	72,89	3,33	85,00	2,93	73.60
16	4.17	66,67	2.26	75,15	3,00	88,00	2.93	76.53
17	4.17	70,83	2.07	77,22	2,67	90,67	2.93	79.47
18	4.17	75,00	1.90	79,12	2,33	93,00	2.93	82.40
19	4.17	79,17	1.74	80,86	2,00	95,00	2.93	85.33
20	4.17	83,33	1.60	82,45	1,67	96,67	2.93	88.27
21	4.17	87,50	1.46	83,91	1,33	98,00	2,93	91,20
22	4.17	91,67	1.34	85,25	1,00	99,00	2.93	94.13
23	4.17	95,83	1.23	86,48	,67	99,67	2.93	97.07
24	4.17	100,00	1.13	87,61	,33	100,00	2.93	100.00

DEPRECIATION SCHEDULES--25 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %
1	4.00	4.00	8.00	8.00	7.69	7.69	8.00	8.00
2	4.00	8.00	7.36	15.36	7.38	15.08	7.36	15.36
3	4.00	12.00	6.77	22.13	7.08	22.15	6.77	22.13
4	4.00	16.00	6.23	28.36	6.77	28.92	6.23	28.36
5	4.00	20.00	5.73	34.09	6.46	35.38	5.73	34.09
6	4.00	24.00	5.27	39.36	6.15	41.54	5.27	39.36
7	4.00	28.00	4.85	44.22	5.85	47.38	4.85	44.22
8	4.00	32.00	4.46	48.68	5.54	52.92	4.46	48.68
9	4.00	36.00	4.11	52.78	5.23	58.15	4.11	52.78
10	4.00	40.00	3.78	56.56	4.92	63.08	3.78	56.56
11	4.00	44.00	3.48	60.04	4.62	67.69	3.48	60.04
12	4.00	48.00	3.20	63.23	4.31	72.00	3.20	63.23
13	4.00	52.00	2.94	66.17	4.00	76.00	2.94	66.17
14	4.00	56.00	2.71	68.88	3.69	79.69	2.82	68.99
15	4.00	60.00	2.49	71.37	3.38	83.08	2.82	71.81
16	4.00	64.00	2.29	73.66	3.08	86.15	2.82	74.63
17	4.00	68.00	2.11	75.77	2.77	88.92	2.82	77.45
18	4.00	72.00	1.94	77.71	2.46	91.38	2.82	80.27
19	4.00	76.00	1.78	79.49	2.15	93.54	2.82	83.09
20	4.00	80.00	1.64	81.13	1.85	95.38	2.82	85.91
21	4.00	84.00	1.51	82.64	1.54	96.92	2.82	88.72
22	4.00	88.00	1.39	84.03	1.23	98.15	2.82	91.54
23	4.00	92.00	1.28	85.31	.92	99.08	2.82	94.36
24	4.00	96.00	1.18	86.48	.62	99.69	2.82	97.18
25	4.00	100.00	1.08	87.56	.31	100.00	2.82	100.00

DEPRECIATION SCHEDULES--26 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULA- TIVE %	%/YEAR	CUMULA- TIVE %	%/YEAR	CUMULA- TIVE %	%/YEAR	CUMULA- TIVE %
1	3.85	3,85	7.69	7.69	7,41	7,41	7.69	7.69
2	3.85	7,69	7.10	14.79	7,12	14.53	7.10	14.79
3	3.85	11,54	6.55	21,35	6,84	21,37	6.55	21.35
4	3.85	15,38	6.05	27,40	6,55	27,92	6.05	27.40
5	3.85	19,23	5.58	32,98	6,27	34,19	5.58	32.98
6	3.85	23,08	5.16	38.14	5,98	40,17	5.16	38.14
7	3.85	26,92	4.76	42,90	5,70	45,87	4.76	42.90
8	3.85	30,77	4.39	47,29	5.41	51,28	4.39	47.29
9	3.85	34,62	4.05	51,34	5,13	56.41	4.05	51.34
10	3.85	38.46	3.74	55,09	4,84	61,25	3.74	55.09
11	3.85	42,31	3.45	58.54	4,56	65.81	3.45	58.54
12	3.85	46,15	3.19	61,73	4,27	70,09	3.19	61.73
13	3.85	50,00	2.94	64.67	3,99	74,07	2.94	64.67
14	3.85	53,85	2.72	67,39	3,70	77,78	2,72	67.39
15	3.85	57,69	2,51	69,90	3,42	81,20	2.72	70.11
16	3.85	61,54	2.32	72,22	3,13	84,33	2.72	72.83
17	3.85	65,38	2.14	74,35	2,85	87.18	2.72	75.54
18	3.85	69,23	1.97	76,33	2,56	89.74	2.72	78.26
19	3.85	73,08	1.82	78,15	2,28	92,02	2.72	80.98
20	3.85	76,92	1.68	79,83	1,99	94,02	2.72	83.70
21	3.85	80,77	1.55	81,38	1,71	95,73	2.72	86.41
22	3.85	84,62	1.43	82.81	1,42	97.15	2.72	89.13
23	3.85	88.46	1.32	84,13	1.14	98,29	2.72	91.85
24	3.85	92,31	1.22	85,35	.85	99,15	2.72	94.57
25	3.85	96,15	1.13	86,48	.57	99,72	2.72	97.28
26	3.85	100,00	1.04	87,52	.28	100,00	2,72	100.00

DEPRECIATION SCHEDULES--27 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %
1	3.70	3.70	7.41	7.41	7.14	7.14	7.41	7.41
2	3.70	7.41	6.86	14.27	6.88	14.02	6.86	14.27
3	3.70	11.11	6.35	20.62	6.61	20.63	6.35	20.62
4	3.70	14.81	5.88	26.50	6.35	26.98	5.88	26.50
5	3.70	18.52	5.44	31.94	6.08	33.07	5.44	31.94
6	3.70	22.22	5.04	36.98	5.82	38.89	5.04	36.98
7	3.70	25.93	4.67	41.65	5.56	44.44	4.67	41.65
8	3.70	29.63	4.32	45.97	5.29	49.74	4.32	45.97
9	3.70	33.33	4.00	49.98	5.03	54.76	4.00	49.98
10	3.70	37.04	3.71	53.68	4.76	59.52	3.71	53.68
11	3.70	40.74	3.43	57.11	4.50	64.02	3.43	57.11
12	3.70	44.44	3.18	60.29	4.23	68.25	3.18	60.29
13	3.70	48.15	2.94	63.23	3.97	72.22	2.94	63.23
14	3.70	51.85	2.72	65.95	3.70	75.93	2.72	65.95
15	3.70	55.56	2.52	68.48	3.44	79.37	2.62	68.57
16	3.70	59.26	2.34	70.81	3.17	82.54	2.62	71.19
17	3.70	62.96	2.16	72.97	2.91	85.45	2.62	73.81
18	3.70	66.67	2.00	74.98	2.65	88.10	2.62	76.43
19	3.70	70.37	1.85	76.83	2.38	90.48	2.62	79.05
20	3.70	74.07	1.72	78.55	2.12	92.59	2.62	81.67
21	3.70	77.78	1.59	80.13	1.85	94.44	2.62	84.29
22	3.70	81.48	1.47	81.61	1.59	96.03	2.62	86.91
23	3.70	85.19	1.36	82.97	1.32	97.35	2.62	89.52
24	3.70	88.89	1.26	84.23	1.06	98.41	2.62	92.14
25	3.70	92.59	1.17	85.40	.79	99.21	2.62	94.76
26	3.70	96.30	1.08	86.48	.53	99.74	2.62	97.38
27	3.70	100.00	1.00	87.48	.26	100.00	2.62	100.00

DEPRECIATION SCHEDULES--28 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %
1	3.57	3.57	7.14	7.14	6.90	6.90	7.14	7.14
2	3.57	7.14	6.63	13.78	6.65	13.55	6.63	13.78
3	3.57	10.71	6.16	19.93	6.40	19.95	6.16	19.93
4	3.57	14.29	5.72	25.65	6.16	26.11	5.72	25.65
5	3.57	17.86	5.31	30.96	5.91	32.02	5.31	30.96
6	3.57	21.43	4.93	35.90	5.67	37.68	4.93	35.90
7	3.57	25.00	4.58	40.47	5.42	43.10	4.58	40.47
8	3.57	28.57	4.25	44.73	5.17	48.28	4.25	44.73
9	3.57	32.14	3.95	48.67	4.93	53.20	3.95	48.67
10	3.57	35.71	3.67	52.34	4.68	57.88	3.67	52.34
11	3.57	39.29	3.40	55.74	4.43	62.32	3.40	55.74
12	3.57	42.86	3.16	58.91	4.19	66.50	3.16	58.91
13	3.57	46.43	2.94	61.84	3.94	70.44	2.94	61.84
14	3.57	50.00	2.73	64.57	3.69	74.14	2.73	64.57
15	3.57	53.57	2.53	67.10	3.45	77.59	2.53	67.10
16	3.57	57.14	2.35	69.45	3.20	80.79	2.53	69.63
17	3.57	60.71	2.18	71.63	2.96	83.74	2.53	72.16
18	3.57	64.29	2.03	73.66	2.71	86.45	2.53	74.69
19	3.57	67.86	1.88	75.54	2.46	88.92	2.53	77.22
20	3.57	71.43	1.75	77.29	2.22	91.13	2.53	79.75
21	3.57	75.00	1.62	78.91	1.97	93.10	2.53	82.28
22	3.57	78.57	1.51	80.41	1.72	94.83	2.53	84.81
23	3.57	82.14	1.40	81.81	1.48	96.31	2.53	87.35
24	3.57	85.71	1.30	83.11	1.23	97.54	2.53	89.88
25	3.57	89.29	1.21	84.32	.99	98.52	2.53	92.41
26	3.57	92.86	1.12	85.44	.74	99.26	2.53	94.94
27	3.57	96.43	1.04	86.48	.49	99.75	2.53	97.47
28	3.57	100.00	.97	87.44	.25	100.00	2.53	100.00

DEPRECIATION SCHEDULES--29 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULA- TIVE %	%/YEAR	CUMULA- TIVE %	%/YEAR	CUMULA- TIVE %	%/YEAR	CUMULA- TIVE %
1	3.45	3.45	6.90	6.90	6.67	6.67	6.90	6.90
2	3.45	6.90	6.42	13.32	6.44	13.10	6.42	13.32
3	3.45	10.34	5.98	19.30	6.21	19.31	5.98	19.30
4	3.45	13.79	5.57	24.86	5.98	25.29	5.57	24.86
5	3.45	17.24	5.18	30.04	5.75	31.03	5.18	30.04
6	3.45	20.69	4.82	34.87	5.52	36.55	4.82	34.87
7	3.45	24.14	4.49	39.36	5.29	41.84	4.49	39.36
8	3.45	27.59	4.18	43.54	5.06	46.90	4.18	43.54
9	3.45	31.03	3.89	47.44	4.83	51.72	3.89	47.44
10	3.45	34.48	3.63	51.06	4.60	56.32	3.63	51.06
11	3.45	37.93	3.38	54.44	4.37	60.69	3.38	54.44
12	3.45	41.38	3.14	57.58	4.14	64.83	3.14	57.58
13	3.45	44.83	2.93	60.50	3.91	68.74	2.93	60.50
14	3.45	48.28	2.72	63.23	3.68	72.41	2.72	63.23
15	3.45	51.72	2.54	65.76	3.45	75.86	2.54	65.76
16	3.45	55.17	2.36	68.12	3.22	79.08	2.45	68.21
17	3.45	58.62	2.20	70.32	2.99	82.07	2.45	70.65
18	3.45	62.07	2.05	72.37	2.76	84.83	2.45	73.10
19	3.45	65.52	1.91	74.28	2.53	87.36	2.45	75.55
20	3.45	68.97	1.77	76.05	2.30	89.66	2.45	77.99
21	3.45	72.41	1.65	77.70	2.07	91.72	2.45	80.44
22	3.45	75.86	1.54	79.24	1.84	93.56	2.45	82.88
23	3.45	79.31	1.43	80.67	1.61	95.17	2.45	85.33
24	3.45	82.76	1.33	82.00	1.38	96.55	2.45	87.77
25	3.45	86.21	1.24	83.25	1.15	97.70	2.45	90.22
26	3.45	89.66	1.16	84.40	.92	98.62	2.45	92.66
27	3.45	93.10	1.08	85.48	.69	99.31	2.45	95.11
28	3.45	96.55	1.00	86.48	.46	99.77	2.45	97.55
29	3.45	100.00	.93	87.41	.23	100.00	2.45	100.00

DEPRECIATION SCHEDULES--30 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %
1	3.33	3.33	6.67	6.67	6.45	6.45	6.67	6.67
2	3.33	6.67	6.22	12.89	6.24	12.69	6.22	12.89
3	3.33	10.00	5.81	18.70	6.02	18.71	5.81	18.70
4	3.33	13.33	5.42	24.12	5.81	24.52	5.42	24.12
5	3.33	16.67	5.06	29.18	5.59	30.11	5.06	29.18
6	3.33	20.00	4.72	33.90	5.38	35.48	4.72	33.90
7	3.33	23.33	4.41	38.30	5.16	40.65	4.41	38.30
8	3.33	26.67	4.11	42.42	4.95	45.59	4.11	42.42
9	3.33	30.00	3.84	46.26	4.73	50.32	3.84	46.26
10	3.33	33.33	3.58	49.84	4.52	54.84	3.58	49.84
11	3.33	36.67	3.34	53.18	4.30	59.14	3.34	53.18
12	3.33	40.00	3.12	56.30	4.09	63.23	3.12	56.30
13	3.33	43.33	2.91	59.22	3.87	67.10	2.91	59.22
14	3.33	46.67	2.72	61.94	3.66	70.75	2.72	61.94
15	3.33	50.00	2.54	64.47	3.44	74.19	2.54	64.47
16	3.33	53.33	2.37	66.84	3.23	77.42	2.37	66.84
17	3.33	56.67	2.21	69.05	3.01	80.43	2.37	69.21
18	3.33	60.00	2.06	71.12	2.80	83.23	2.37	71.58
19	3.33	63.33	1.93	73.04	2.58	85.81	2.37	73.95
20	3.33	66.67	1.80	74.84	2.37	88.17	2.37	76.32
21	3.33	70.00	1.68	76.52	2.15	90.32	2.37	78.68
22	3.33	73.33	1.57	78.08	1.94	92.26	2.37	81.05
23	3.33	76.67	1.46	79.54	1.72	93.98	2.37	83.42
24	3.33	80.00	1.36	80.91	1.51	95.48	2.37	85.79
25	3.33	83.33	1.27	82.18	1.29	96.77	2.37	88.16
26	3.33	86.67	1.19	83.37	1.08	97.85	2.37	90.53
27	3.33	90.00	1.11	84.48	[illegible]	98.71	2.37	92.89
28	3.33	93.33	1.03	85.51	.65	99.35	2.37	95.26
29	3.33	96.67	.97	86.48	.43	99.78	2.37	97.63
30	3.33	100.00	.90	87.38	.22	100.00	2.37	100.00

DEPRECIATION SCHEDULES--31 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %
1	3.23	3.23	6.45	6.45	6.25	6.25	6.45	6.45
2	3.23	6.45	6.04	12.49	6.05	12.30	6.04	12.49
3	3.23	9.68	5.65	18.13	5.85	18.15	5.65	18.13
4	3.23	12.90	5.28	23.41	5.65	23.79	5.28	23.41
5	3.23	16.13	4.94	28.36	5.44	29.23	4.94	28.36
6	3.23	19.35	4.62	32.98	5.24	34.48	4.62	32.98
7	3.23	22.58	4.32	37.30	5.04	39.52	4.32	37.30
8	3.23	25.81	4.05	41.35	4.84	44.35	4.05	41.35
9	3.23	29.03	3.78	45.13	4.64	48.99	3.78	45.13
10	3.23	32.26	3.54	48.67	4.44	53.43	3.54	48.67
11	3.23	35.48	3.31	51.98	4.23	57.66	3.31	51.98
12	3.23	38.71	3.10	55.08	4.03	61.69	3.10	55.08
13	3.23	41.94	2.90	57.98	3.83	65.52	2.90	57.98
14	3.23	45.16	2.71	60.69	3.63	69.15	2.71	60.69
15	3.23	48.39	2.54	63.23	3.43	72.58	2.54	63.23
16	3.23	51.61	2.37	65.60	3.23	75.81	2.37	65.60
17	3.23	54.84	2.22	67.82	3.02	78.83	2.29	67.89
18	3.23	58.06	2.08	69.89	2.82	81.65	2.29	70.19
19	3.23	61.29	1.94	71.84	2.62	84.27	2.29	72.48
20	3.23	64.52	1.82	73.65	2.42	86.69	2.29	74.77
21	3.23	67.74	1.70	75.35	2.22	88.91	2.29	77.07
22	3.23	70.97	1.59	76.94	2.02	90.93	2.29	79.36
23	3.23	74.19	1.49	78.43	1.81	92.74	2.29	81.65
24	3.23	77.42	1.39	79.82	1.61	94.35	2.29	83.95
25	3.23	80.65	1.30	81.12	1.41	95.77	2.29	86.24
26	3.23	83.87	1.22	82.34	1.21	96.98	2.29	88.53
27	3.23	87.10	1.14	83.48	1.01	97.98	2.29	90.83
28	3.23	90.32	1.07	84.55	.81	98.79	2.29	93.12
29	3.23	93.55	1.00	85.54	.60	99.40	2.29	95.41
30	3.23	96.77	.93	86.48	.40	99.80	2.29	97.71
31	3.23	100.00	.87	87.35	.20	100.00	2.29	100.00

DEPRECIATION SCHEDULES--32 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %
1	3.13	3.13	6.25	6.25	6.06	6.06	6.25	6.25
2	3.13	6.25	5.86	12.11	5.87	11.93	5.86	12.11
3	3.13	9.38	5.49	17.60	5.68	17.61	5.49	17.60
4	3.13	12.50	5.15	22.75	5.49	23.11	5.15	22.75
5	3.13	15.63	4.83	27.58	5.30	28.41	4.83	27.58
6	3.13	18.75	4.53	32.11	5.11	33.52	4.53	32.11
7	3.13	21.88	4.24	36.35	4.92	38.45	4.24	36.35
8	3.13	25.00	3.98	40.33	4.73	43.18	3.98	40.33
9	3.13	28.13	3.73	44.06	4.55	47.73	3.73	44.06
10	3.13	31.25	3.50	47.55	4.36	52.08	3.50	47.55
11	3.13	34.38	3.28	50.83	4.17	56.25	3.28	50.83
12	3.13	37.50	3.07	53.90	3.98	60.23	3.07	53.90
13	3.13	40.63	2.88	56.79	3.79	64.02	2.88	56.79
14	3.13	43.75	2.70	59.49	3.60	67.61	2.70	59.49
15	3.13	46.88	2.53	62.02	3.41	71.02	2.53	62.02
16	3.13	50.00	2.37	64.39	3.22	74.24	2.37	64.39
17	3.13	53.13	2.23	66.62	3.03	77.27	2.23	66.62
18	3.13	56.25	2.09	68.70	2.84	80.11	2.23	68.84
19	3.13	59.38	1.96	70.66	2.65	82.77	2.23	71.07
20	3.13	62.50	1.83	72.49	2.46	85.23	2.23	73.29
21	3.13	65.63	1.72	74.21	2.27	87.50	2.23	75.52
22	3.13	68.75	1.61	75.82	2.08	89.58	2.23	77.75
23	3.13	71.88	1.51	77.34	1.89	91.48	2.23	79.97
24	3.13	75.00	1.42	78.75	1.70	93.18	2.23	82.20
25	3.13	78.13	1.33	80.08	1.52	94.70	2.23	84.42
26	3.13	81.25	1.24	81.33	1.33	96.02	2.23	86.65
27	3.13	84.38	1.17	82.49	1.14	97.16	2.23	88.87
28	3.13	87.50	1.09	83.59	.95	98.11	2.23	91.10
29	3.13	90.63	1.03	84.61	.76	98.86	2.23	93.32
30	3.13	93.75	.96	85.57	.57	99.43	2.23	95.55
31	3.13	96.88	.90	86.48	.38	99.81	2.23	97.77
32	3.13	100.00	.85	87.32	.19	100.00	2.23	100.00

DEPRECIATION SCHEDULES--33 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %
1	3.03	3.03	6.06	6.06	5.88	5.88	6.06	6.06
2	3.03	6.06	5.69	11.75	5.70	11.59	5.69	11.75
3	3.03	9.09	5.35	17.10	5.53	17.11	5.35	17.10
4	3.03	12.12	5.02	22.13	5.35	22.46	5.02	22.13
5	3.03	15.15	4.72	26.85	5.17	27.63	4.72	26.85
6	3.03	18.18	4.43	31.28	4.99	32.62	4.43	31.28
7	3.03	21.21	4.16	35.44	4.81	37.43	4.16	35.44
8	3.03	24.24	3.91	39.36	4.63	42.07	3.91	39.36
9	3.03	27.27	3.68	43.03	4.46	46.52	3.68	43.03
10	3.03	30.30	3.45	46.48	4.28	50.80	3.45	46.48
11	3.03	33.33	3.24	49.73	4.10	54.90	3.24	49.73
12	3.03	36.36	3.05	52.77	3.92	58.82	3.05	52.77
13	3.03	39.39	2.86	55.64	3.74	62.57	2.86	55.64
14	3.03	42.42	2.69	58.33	3.57	66.13	2.69	58.33
15	3.03	45.45	2.53	60.85	3.39	69.52	2.53	60.85
16	3.03	48.48	2.37	63.22	3.21	72.73	2.37	63.22
17	3.03	51.52	2.23	65.45	3.03	75.76	2.23	65.45
18	3.03	54.55	2.09	67.55	2.85	78.61	2.16	67.61
19	3.03	57.58	1.97	69.51	2.67	81.28	2.16	69.77
20	3.03	60.61	1.85	71.36	2.50	83.78	2.16	71.93
21	3.03	63.64	1.74	73.10	2.32	86.10	2.16	74.09
22	3.03	66.67	1.63	74.73	2.14	88.24	2.16	76.25
23	3.03	69.70	1.53	76.26	1.96	90.20	2.16	78.41
24	3.03	72.73	1.44	77.70	1.78	91.98	2.16	80.57
25	3.03	75.76	1.35	79.05	1.60	93.58	2.16	82.73
26	3.03	78.79	1.27	80.32	1.43	95.01	2.16	84.89
27	3.03	81.82	1.19	81.51	1.25	96.26	2.16	87.04
28	3.03	84.85	1.12	82.63	1.07	97.33	2.16	89.20
29	3.03	87.88	1.05	83.69	.89	98.22	2.16	91.36
30	3.03	90.91	.99	84.67	.71	98.93	2.16	93.52
31	3.03	93.94	.93	85.60	.53	99.47	2.16	95.68
32	3.03	96.97	.87	86.48	.36	99.82	2.16	97.84
33	3.03	100.00	.82	87.29	.18	100.00	2.16	100.00

DEPRECIATION SCHEDULES--34 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %
1	2.94	2.94	5.88	5.88	5.71	5.71	5.88	5.88
2	2.94	5.88	5.54	11.42	5.55	11.26	5.54	11.42
3	2.94	8.82	5.21	16.63	5.38	16.64	5.21	16.63
4	2.94	11.76	4.90	21.53	5.21	21.85	4.90	21.53
5	2.94	14.71	4.62	26.15	5.04	26.89	4.62	26.15
6	2.94	17.65	4.34	30.49	4.87	31.76	4.34	30.49
7	2.94	20.59	4.09	34.58	4.71	36.47	4.09	34.58
8	2.94	23.53	3.85	38.43	4.54	41.01	3.85	38.43
9	2.94	26.47	3.62	42.05	4.37	45.38	3.62	42.05
10	2.94	29.41	3.41	45.46	4.20	49.58	3.41	45.46
11	2.94	32.35	3.21	48.67	4.03	53.61	3.21	48.67
12	2.94	35.29	3.02	51.69	3.87	57.48	3.02	51.69
13	2.94	38.24	2.84	54.53	3.70	61.18	2.84	54.53
14	2.94	41.18	2.67	57.20	3.53	64.71	2.67	57.20
15	2.94	44.12	2.52	59.72	3.36	68.07	2.52	59.72
16	2.94	47.06	2.37	62.09	3.19	71.26	2.37	62.09
17	2.94	50.00	2.23	64.32	3.03	74.29	2.23	64.32
18	2.94	52.94	2.10	66.42	2.86	77.14	2.10	66.42
19	2.94	55.88	1.98	68.40	2.69	79.83	2.10	68.52
20	2.94	58.82	1.86	70.25	2.52	82.35	2.10	70.62
21	2.94	61.76	1.75	72.00	2.35	84.71	2.10	72.72
22	2.94	64.71	1.65	73.65	2.18	86.89	2.10	74.82
23	2.94	67.65	1.55	75.20	2.02	88.91	2.10	76.91
24	2.94	70.59	1.46	76.66	1.85	90.76	2.10	79.01
25	2.94	73.53	1.37	78.03	1.68	92.44	2.10	81.11
26	2.94	76.47	1.29	79.32	1.51	93.95	2.10	83.21
27	2.94	79.41	1.22	80.54	1.34	95.29	2.10	85.31
28	2.94	82.35	1.14	81.69	1.18	96.47	2.10	87.41
29	2.94	85.29	1.08	82.76	1.01	97.48	2.10	89.51
30	2.94	88.24	1.01	83.78	.84	98.32	2.10	91.61
31	2.94	91.18	.95	84.73	.67	98.99	2.10	93.70
32	2.94	94.12	.90	85.63	.50	99.50	2.10	95.80
33	2.94	97.06	.85	86.47	.34	99.83	2.10	97.90
34	2.94	100.00	.80	87.27	.17	100.00	2.10	100.00

DEPRECIATION SCHEDULES--35 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %
1	2.86	2.86	5.71	5.71	5.56	5.56	5.71	5.71
2	2.86	5.71	5.39	11.10	5.40	10.95	5.39	11.10
3	2.86	8.57	5.08	16.18	5.24	16.19	5.08	16.18
4	2.86	11.43	4.79	20.97	5.08	21.27	4.79	20.97
5	2.86	14.29	4.52	25.49	4.92	26.19	4.52	25.49
6	2.86	17.14	4.26	29.75	4.76	30.95	4.26	29.75
7	2.86	20.00	4.01	33.76	4.60	35.56	4.01	33.76
8	2.86	22.86	3.79	37.55	4.44	40.00	3.79	37.55
9	2.86	25.71	3.57	41.11	4.29	44.29	3.57	41.11
10	2.86	28.57	3.36	44.48	4.13	48.41	3.36	44.48
11	2.86	31.43	3.17	47.65	3.97	52.38	3.17	47.65
12	2.86	34.29	2.99	50.64	3.81	56.19	2.99	50.64
13	2.86	37.14	2.82	53.46	3.65	59.84	2.82	53.46
14	2.86	40.00	2.66	56.12	3.49	63.33	2.66	56.12
15	2.86	42.86	2.51	58.63	3.33	66.67	2.51	58.63
16	2.86	45.71	2.36	60.99	3.17	69.84	2.36	60.99
17	2.86	48.57	2.23	63.22	3.02	72.86	2.23	63.22
18	2.86	51.43	2.10	65.32	2.86	75.71	2.10	65.32
19	2.86	54.29	1.98	67.31	2.70	78.41	2.04	67.36
20	2.86	57.14	1.87	69.17	2.54	80.95	2.04	69.40
21	2.86	60.00	1.76	70.94	2.38	83.33	2.04	71.44
22	2.86	62.86	1.66	72.60	2.22	85.56	2.04	73.48
23	2.86	65.71	1.57	74.16	2.06	87.62	2.04	75.52
24	2.86	68.57	1.48	75.64	1.90	89.52	2.04	77.56
25	2.86	71.43	1.39	77.03	1.75	91.27	2.04	79.60
26	2.86	74.29	1.31	78.34	1.59	92.86	2.04	81.64
27	2.86	77.14	1.24	79.58	1.43	94.29	2.04	83.68
28	2.86	80.00	1.17	80.75	1.27	95.56	2.04	85.72
29	2.86	82.86	1.10	81.85	1.11	96.67	2.04	87.76
30	2.86	85.71	1.04	82.88	.95	97.62	2.04	89.80
31	2.86	88.57	.98	83.86	.79	98.41	2.04	91.84
32	2.86	91.43	.92	84.79	.63	99.05	2.04	93.88
33	2.86	94.29	.87	85.65	.48	99.52	2.04	95.92
34	2.86	97.14	.82	86.47	.32	99.84	2.04	97.96
35	2.86	100.00	.77	87.25	.16	100.00	2.04	100.00

DEPRECIATION SCHEDULES--36 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %
1	2.78	2.78	5.56	5.56	5.41	5.41	5.56	5.56
2	2.78	5.56	5.25	10.80	5.26	10.66	5.25	10.80
3	2.78	8.33	4.96	15.76	5.11	15.77	4.96	15.76
4	2.78	11.11	4.68	20.44	4.95	20.72	4.68	20.44
5	2.78	13.89	4.42	24.86	4.80	25.53	4.42	24.86
6	2.78	16.67	4.17	29.03	4.65	30.18	4.17	29.03
7	2.78	19.44	3.94	32.98	4.50	34.68	3.94	32.98
8	2.78	22.22	3.72	36.70	4.35	39.04	3.72	36.70
9	2.78	25.00	3.52	40.22	4.20	43.24	3.52	40.22
10	2.78	27.78	3.32	43.54	4.05	47.30	3.32	43.54
11	2.78	30.56	3.14	46.67	3.90	51.20	3.14	46.67
12	2.78	33.33	2.96	49.64	3.75	54.95	2.96	49.64
13	2.78	36.11	2.80	52.43	3.60	58.56	2.80	52.43
14	2.78	38.89	2.64	55.08	3.45	62.01	2.64	55.08
15	2.78	41.67	2.50	57.57	3.30	65.32	2.50	57.57
16	2.78	44.44	2.36	59.93	3.15	68.47	2.36	59.93
17	2.78	47.22	2.23	62.16	3.00	71.47	2.23	62.16
18	2.78	50.00	2.10	64.26	2.85	74.32	2.10	64.26
19	2.78	52.78	1.99	66.24	2.70	77.03	1.99	66.24
20	2.78	55.56	1.88	68.12	2.55	79.58	1.99	68.23
21	2.78	58.33	1.77	69.89	2.40	81.98	1.99	70.22
22	2.78	61.11	1.67	71.56	2.25	84.23	1.99	72.20
23	2.78	63.89	1.58	73.14	2.10	86.34	1.99	74.19
24	2.78	66.67	1.49	74.64	1.95	88.29	1.99	76.17
25	2.78	69.44	1.41	76.04	1.80	90.09	1.99	78.16
26	2.78	72.22	1.33	77.38	1.65	91.74	1.99	80.14
27	2.78	75.00	1.26	78.63	1.50	93.24	1.99	82.13
28	2.78	77.78	1.19	79.82	1.35	94.59	1.99	84.11
29	2.78	80.56	1.12	80.94	1.20	95.80	1.99	86.10
30	2.78	83.33	1.06	82.00	1.05	96.85	1.99	88.09
31	2.78	86.11	1.00	83.00	.90	97.75	1.99	90.07
32	2.78	88.89	.94	83.94	.75	98.50	1.99	92.06
33	2.78	91.67	.89	84.84	.60	99.10	1.99	94.04
34	2.78	94.44	.84	85.68	.45	99.55	1.99	96.03
35	2.78	97.22	.80	86.47	.30	99.85	1.99	98.01
36	2.78	100.00	.75	87.23	.15	100.00	1.99	100.00

DEPRECIATION SCHEDULES--37 YEAR LIFETIME

YEAR	STRAIGHT LINE %/YEAR	STRAIGHT LINE CUMULATIVE %	DOUBLE DECLINING %/YEAR	DOUBLE DECLINING CUMULATIVE %	SUM OF DIGITS %/YEAR	SUM OF DIGITS CUMULATIVE %	DOUBLE DECLINING /STRAIGHT LINE %/YEAR	DOUBLE DECLINING /STRAIGHT LINE CUMULATIVE %
1	2.70	2.70	5.41	5.41	5.26	5.26	5.41	5.41
2	2.70	5.41	5.11	10.52	5.12	10.38	5.11	10.52
3	2.70	8.11	4.84	15.36	4.98	15.36	4.84	15.36
4	2.70	10.81	4.58	19.93	4.84	20.20	4.58	19.93
5	2.70	13.51	4.33	24.26	4.69	24.89	4.33	24.26
6	2.70	16.22	4.09	28.35	4.55	29.45	4.09	28.35
7	2.70	18.92	3.87	32.23	4.41	33.85	3.87	32.23
8	2.70	21.62	3.66	35.89	4.27	38.12	3.66	35.89
9	2.70	24.32	3.47	39.35	4.13	42.25	3.47	39.35
10	2.70	27.03	3.28	42.63	3.98	46.23	3.28	42.63
11	2.70	29.73	3.10	45.73	3.84	50.07	3.10	45.73
12	2.70	32.43	2.93	48.67	3.70	53.77	2.93	48.67
13	2.70	35.14	2.77	51.44	3.56	57.33	2.77	51.44
14	2.70	37.84	2.62	54.07	3.41	60.74	2.62	54.07
15	2.70	40.54	2.48	56.55	3.27	64.01	2.48	56.55
16	2.70	43.24	2.35	58.90	3.13	67.14	2.35	58.90
17	2.70	45.95	2.22	61.12	2.99	70.13	2.22	61.12
18	2.70	48.65	2.10	63.22	2.84	72.97	2.10	63.22
19	2.70	51.35	1.99	65.21	2.70	75.68	1.99	65.21
20	2.70	54.05	1.88	67.09	2.56	78.24	1.93	67.14
21	2.70	56.76	1.78	68.87	2.42	80.65	1.93	69.08
22	2.70	59.46	1.68	70.55	2.28	82.93	1.93	71.01
23	2.70	62.16	1.59	72.14	2.13	85.06	1.93	72.94
24	2.70	64.86	1.51	73.65	1.99	87.06	1.93	74.87
25	2.70	67.57	1.42	75.07	1.85	88.90	1.93	76.81
26	2.70	70.27	1.35	76.42	1.71	90.61	1.93	78.74
27	2.70	72.97	1.27	77.70	1.56	92.18	1.93	80.67
28	2.70	75.68	1.21	78.90	1.42	93.60	1.93	82.60
29	2.70	78.38	1.14	80.04	1.28	94.88	1.93	84.54
30	2.70	81.08	1.08	81.12	1.14	96.02	1.93	86.47
31	2.70	83.78	1.02	82.14	1.00	97.01	1.93	88.40
32	2.70	86.49	.97	83.11	.85	97.87	1.93	90.34
33	2.70	89.19	.91	84.02	.71	98.58	1.93	92.27
34	2.70	91.89	.86	84.88	.57	99.15	1.93	94.20
35	2.70	94.59	.82	85.70	.43	99.57	1.93	96.13
36	2.70	97.30	.77	86.47	.28	99.86	1.93	98.07
37	2.70	100.00	.73	87.20	.14	100.00	1.93	100.00

DEPRECIATION SCHEDULES--38 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %
1	2.63	2.63	5.26	5.26	5.13	5.13	5.26	5.26
2	2.63	5.26	4.99	10.25	4.99	10.12	4.99	10.25
3	2.63	7.89	4.72	14.97	4.86	14.98	4.72	14.97
4	2.63	10.53	4.48	19.45	4.72	19.70	4.48	19.45
5	2.63	13.16	4.24	23.69	4.59	24.29	4.24	23.69
6	2.63	15.79	4.02	27.70	4.45	28.74	4.02	27.70
7	2.63	18.42	3.81	31.51	4.32	33.06	3.81	31.51
8	2.63	21.05	3.60	35.11	4.18	37.25	3.60	35.11
9	2.63	23.68	3.42	38.53	4.05	41.30	3.42	38.53
10	2.63	26.32	3.24	41.76	3.91	45.21	3.24	41.76
11	2.63	28.95	3.07	44.83	3.78	48.99	3.07	44.83
12	2.63	31.58	2.90	47.73	3.64	52.63	2.90	47.73
13	2.63	34.21	2.75	50.48	3.51	56.14	2.75	50.48
14	2.63	36.84	2.61	53.09	3.37	59.51	2.61	53.09
15	2.63	39.47	2.47	55.56	3.24	62.75	2.47	55.56
16	2.63	42.11	2.34	57.90	3.10	65.86	2.34	57.90
17	2.63	44.74	2.22	60.11	2.97	68.83	2.22	60.11
18	2.63	47.37	2.10	62.21	2.83	71.66	2.10	62.21
19	2.63	50.00	1.99	64.20	2.70	74.36	1.99	64.20
20	2.63	52.63	1.88	66.09	2.56	76.92	1.88	66.09
21	2.63	55.26	1.78	67.67	2.43	79.35	1.88	67.97
22	2.63	57.89	1.69	69.56	2.29	81.65	1.88	69.85
23	2.63	60.53	1.60	71.16	2.16	83.81	1.88	71.74
24	2.63	63.16	1.52	72.68	2.02	85.83	1.88	73.62
25	2.63	65.79	1.44	74.12	1.89	87.72	1.88	75.51
26	2.63	68.42	1.36	75.48	1.75	89.47	1.88	77.39
27	2.63	71.05	1.29	76.77	1.62	91.09	1.88	79.27
28	2.63	73.68	1.22	77.99	1.48	92.58	1.88	81.16
29	2.63	76.32	1.16	79.15	1.35	93.93	1.88	83.04
30	2.63	78.95	1.10	80.25	1.21	95.14	1.88	84.93
31	2.63	81.58	1.04	81.29	1.08	96.22	1.88	86.81
32	2.63	84.21	.98	82.27	.94	97.17	1.88	88.70
33	2.63	86.84	.93	83.21	.81	97.98	1.88	90.58
34	2.63	89.47	.88	84.09	.67	98.65	1.88	92.46
35	2.63	92.11	.84	84.93	.54	99.19	1.88	94.35
36	2.63	94.74	.79	85.72	.40	99.60	1.88	96.23
37	2.63	97.37	.75	86.47	.27	99.87	1.88	98.12
38	2.63	100.00	.71	87.19	.13	100.00	1.88	100.00

DEPRECIATION SCHEDULES--39 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %
1	2.56	2.56	5.13	5.13	5.00	5.00	5.13	5.13
2	2.56	5.13	4.87	9.99	4.87	9.87	4.87	9.99
3	2.56	7.69	4.62	14.61	4.74	14.62	4.62	14.61
4	2.56	10.26	4.38	18.99	4.62	19.23	4.38	18.99
5	2.56	12.82	4.15	23.14	4.49	23.72	4.15	23.14
6	2.56	15.38	3.94	27.08	4.36	28.08	3.94	27.08
7	2.56	17.95	3.74	30.82	4.23	32.31	3.74	30.82
8	2.56	20.51	3.55	34.37	4.10	36.41	3.55	34.37
9	2.56	23.08	3.37	37.74	3.97	40.38	3.37	37.74
10	2.56	25.64	3.19	40.93	3.85	44.23	3.19	40.93
11	2.56	28.21	3.03	43.96	3.72	47.95	3.03	43.96
12	2.56	30.77	2.87	46.83	3.59	51.54	2.87	46.83
13	2.56	33.33	2.73	49.56	3.46	55.00	2.73	49.56
14	2.56	35.90	2.59	52.15	3.33	58.33	2.59	52.15
15	2.56	38.46	2.45	54.60	3.21	61.54	2.45	54.60
16	2.56	41.03	2.33	56.93	3.08	64.62	2.33	56.93
17	2.56	43.59	2.21	59.14	2.95	67.56	2.21	59.14
18	2.56	46.15	2.10	61.23	2.82	70.38	2.10	61.23
19	2.56	48.72	1.99	63.22	2.69	73.08	1.99	63.22
20	2.56	51.28	1.89	65.11	2.56	75.64	1.89	65.11
21	2.56	53.85	1.79	66.90	2.44	78.08	1.84	66.94
22	2.56	56.41	1.70	68.59	2.31	80.38	1.84	68.78
23	2.56	58.97	1.61	70.20	2.18	82.56	1.84	70.62
24	2.56	61.54	1.53	71.73	2.05	84.62	1.84	72.45
25	2.56	64.10	1.45	73.18	1.92	86.54	1.84	74.29
26	2.56	66.67	1.38	74.56	1.79	88.33	1.84	76.13
27	2.56	69.23	1.30	75.86	1.67	90.00	1.84	77.96
28	2.56	71.79	1.24	77.10	1.54	91.54	1.84	79.80
29	2.56	74.36	1.17	78.27	1.41	92.95	1.84	81.64
30	2.56	76.92	1.11	79.39	1.28	94.23	1.84	83.47
31	2.56	79.49	1.06	80.45	1.15	95.38	1.84	85.31
32	2.56	82.05	1.00	81.45	1.03	96.41	1.84	87.14
33	2.56	84.62	.95	82.40	.90	97.31	1.84	88.98
34	2.56	87.18	.90	83.30	.77	98.08	1.84	90.82
35	2.56	89.74	.86	84.16	.64	98.72	1.84	92.65
36	2.56	92.31	.81	84.97	.51	99.23	1.84	94.49
37	2.56	94.87	.77	85.74	.38	99.62	1.84	96.33
38	2.56	97.44	.73	86.47	.26	99.87	1.84	98.16
39	2.56	100.00	.69	87.17	.13	100.00	1.84	100.00

DEPRECIATION SCHEDULES--40 YEAR LIFETIME

YEAR	STRAIGHT LINE %/YEAR	STRAIGHT LINE CUMULA-TIVE %	DOUBLE DECLINING %/YEAR	DOUBLE DECLINING CUMULA-TIVE %	SUM OF DIGITS %/YEAR	SUM OF DIGITS CUMULA-TIVE %	DOUBLE DECLINING /STRAIGHT LINE %/YEAR	DOUBLE DECLINING /STRAIGHT LINE CUMULA-TIVE %
1	2.50	2.50	5.00	5.00	4.88	4.88	5.00	5.00
2	2.50	5.00	4.75	9.75	4.76	9.63	4.75	9.75
3	2.50	7.50	4.51	14.26	4.63	14.27	4.51	14.26
4	2.50	10.00	4.29	18.55	4.51	18.78	4.29	18.55
5	2.50	12.50	4.07	22.62	4.39	23.17	4.07	22.62
6	2.50	15.00	3.87	26.49	4.27	27.44	3.87	26.49
7	2.50	17.50	3.68	30.17	4.15	31.59	3.68	30.17
8	2.50	20.00	3.49	33.66	4.02	35.61	3.49	33.66
9	2.50	22.50	3.32	36.98	3.90	39.51	3.32	36.98
10	2.50	25.00	3.15	40.13	3.78	43.29	3.15	40.13
11	2.50	27.50	2.99	43.12	3.66	46.95	2.99	43.12
12	2.50	30.00	2.84	45.96	3.54	50.49	2.84	45.96
13	2.50	32.50	2.70	48.67	3.41	53.90	2.70	48.67
14	2.50	35.00	2.57	51.23	3.29	57.20	2.57	51.23
15	2.50	37.50	2.44	53.67	3.17	60.37	2.44	53.67
16	2.50	40.00	2.32	55.99	3.05	63.41	2.32	55.99
17	2.50	42.50	2.20	58.19	2.93	66.34	2.20	58.19
18	2.50	45.00	2.09	60.28	2.80	69.15	2.09	60.28
19	2.50	47.50	1.99	62.26	2.68	71.83	1.99	62.26
20	2.50	50.00	1.89	64.15	2.56	74.39	1.89	64.15
21	2.50	52.50	1.79	65.94	2.44	76.83	1.79	65.94
22	2.50	55.00	1.70	67.65	2.32	79.15	1.79	67.74
23	2.50	57.50	1.62	69.26	2.20	81.34	1.79	69.53
24	2.50	60.00	1.54	70.80	2.07	83.41	1.79	71.32
25	2.50	62.50	1.46	72.26	1.95	85.37	1.79	73.11
26	2.50	65.00	1.39	73.65	1.83	87.20	1.79	74.91
27	2.50	67.50	1.32	74.97	1.71	88.90	1.79	76.70
28	2.50	70.00	1.25	76.22	1.59	90.49	1.79	78.49
29	2.50	72.50	1.19	77.41	1.46	91.95	1.79	80.28
30	2.50	75.00	1.13	78.54	1.34	93.29	1.79	82.08
31	2.50	77.50	1.07	79.61	1.22	94.51	1.79	83.87
32	2.50	80.00	1.02	80.63	1.10	95.61	1.79	85.66
33	2.50	82.50	.97	81.60	.98	96.59	1.79	87.45
34	2.50	85.00	.92	82.52	.85	97.44	1.79	89.25
35	2.50	87.50	.87	83.39	.73	98.17	1.79	91.04
36	2.50	90.00	.83	84.22	.61	98.78	1.79	92.83
37	2.50	92.50	.79	85.01	.49	99.27	1.79	94.62
38	2.50	95.00	.75	85.76	.37	99.63	1.79	96.42
39	2.50	97.50	.71	86.47	.24	99.88	1.79	98.21
40	2.50	100.00	.68	87.15	.12	100.00	1.79	100.00

DEPRECIATION SCHEDULES--41 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %
1	2.44	2.44	4.88	4.88	4.76	4.76	4.88	4.88
2	2.44	4.88	4.64	9.52	4.65	9.41	4.64	9.52
3	2.44	7.32	4.41	13.93	4.53	13.94	4.41	13.93
4	2.44	9.76	4.20	18.13	4.41	18.35	4.20	18.13
5	2.44	12.20	3.99	22.12	4.30	22.65	3.99	22.12
6	2.44	14.63	3.80	25.92	4.18	26.83	3.80	25.92
7	2.44	17.07	3.61	29.54	4.07	30.89	3.61	29.54
8	2.44	19.51	3.44	32.97	3.95	34.84	3.44	32.97
9	2.44	21.95	3.27	36.24	3.83	38.68	3.27	36.24
10	2.44	24.39	3.11	39.35	3.72	42.39	3.11	39.35
11	2.44	26.83	2.96	42.31	3.60	45.99	2.96	42.31
12	2.44	29.27	2.81	45.13	3.48	49.48	2.81	45.13
13	2.44	31.71	2.68	47.80	3.37	52.85	2.68	47.80
14	2.44	34.15	2.55	50.35	3.25	56.10	2.55	50.35
15	2.44	36.59	2.42	52.77	3.14	59.23	2.42	52.77
16	2.44	39.02	2.30	55.07	3.02	62.25	2.30	55.07
17	2.44	41.46	2.19	57.27	2.90	65.16	2.19	57.27
18	2.44	43.90	2.08	59.35	2.79	67.94	2.08	59.35
19	2.44	46.34	1.98	61.33	2.67	70.62	1.98	61.33
20	2.44	48.78	1.89	63.22	2.56	73.17	1.89	63.22
21	2.44	51.22	1.79	65.01	2.44	75.61	1.79	65.01
22	2.44	53.66	1.71	66.72	2.32	77.93	1.75	66.76
23	2.44	56.10	1.62	68.34	2.21	80.14	1.75	68.51
24	2.44	58.54	1.54	69.89	2.09	82.23	1.75	70.26
25	2.44	60.98	1.47	71.36	1.97	84.20	1.75	72.01
26	2.44	63.41	1.40	72.75	1.86	86.06	1.75	73.76
27	2.44	65.85	1.33	74.08	1.74	87.80	1.75	75.51
28	2.44	68.29	1.26	75.35	1.63	89.43	1.75	77.26
29	2.44	70.73	1.20	76.55	1.51	90.94	1.75	79.01
30	2.44	73.17	1.14	77.69	1.39	92.33	1.75	80.76
31	2.44	75.61	1.09	78.78	1.28	93.61	1.75	82.51
32	2.44	78.05	1.04	79.82	1.16	94.77	1.75	84.26
33	2.44	80.49	.98	80.80	1.05	95.82	1.75	86.01
34	2.44	82.93	.94	81.74	.93	96.75	1.75	87.75
35	2.44	85.37	.89	82.63	.81	97.56	1.75	89.50
36	2.44	87.80	.85	83.48	.70	98.26	1.75	91.25
37	2.44	90.24	.81	84.28	.58	98.84	1.75	93.00
38	2.44	92.68	.77	85.05	.46	99.30	1.75	94.75
39	2.44	95.12	.73	85.78	.35	99.65	1.75	96.50
40	2.44	97.56	.69	86.47	.23	99.88	1.75	98.25
41	2.44	100.00	.66	87.13	.12	100.00	1.75	100.00

DEPRECIATION SCHEDULES--42 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %
1	2.38	2.38	4.76	4.76	4.65	4.65	4.76	4.76
2	2.38	4.76	4.54	9.30	4.54	9.19	4.54	9.30
3	2.38	7.14	4.32	13.62	4.43	13.62	4.32	13.62
4	2.38	9.52	4.11	17.73	4.32	17.94	4.11	17.73
5	2.38	11.90	3.92	21.65	4.21	22.15	3.92	21.65
6	2.38	14.29	3.73	25.38	4.10	26.25	3.73	25.38
7	2.38	16.67	3.55	28.93	3.99	30.23	3.55	28.93
8	2.38	19.05	3.38	32.32	3.88	34.11	3.38	32.32
9	2.38	21.43	3.22	35.54	3.77	37.87	3.22	35.54
10	2.38	23.81	3.07	38.61	3.65	41.53	3.07	38.61
11	2.38	26.19	2.92	41.53	3.54	45.07	2.92	41.53
12	2.38	28.57	2.78	44.32	3.43	48.50	2.78	44.32
13	2.38	30.95	2.65	46.97	3.32	51.83	2.65	46.97
14	2.38	33.33	2.53	49.49	3.21	55.04	2.53	49.49
15	2.38	35.71	2.41	51.90	3.10	58.14	2.41	51.90
16	2.38	38.10	2.29	54.19	2.99	61.13	2.29	54.19
17	2.38	40.48	2.18	56.37	2.88	64.01	2.18	56.37
18	2.38	42.86	2.08	58.45	2.77	66.78	2.08	58.45
19	2.38	45.24	1.98	60.43	2.66	69.44	1.98	60.43
20	2.38	47.62	1.88	62.31	2.55	71.98	1.88	62.31
21	2.38	50.00	1.79	64.11	2.44	74.42	1.79	64.11
22	2.38	52.38	1.71	65.82	2.33	76.74	1.71	65.82
23	2.38	54.76	1.63	67.44	2.21	78.96	1.71	67.52
24	2.38	57.14	1.55	68.99	2.10	81.06	1.71	69.23
25	2.38	59.52	1.48	70.47	1.99	83.06	1.71	70.94
26	2.38	61.90	1.41	71.88	1.88	84.94	1.71	72.65
27	2.38	64.29	1.34	73.22	1.77	86.71	1.71	74.36
28	2.38	66.67	1.28	74.49	1.66	88.37	1.71	76.07
29	2.38	69.05	1.21	75.71	1.55	89.92	1.71	77.78
30	2.38	71.43	1.16	76.86	1.44	91.36	1.71	79.49
31	2.38	73.81	1.10	77.96	1.33	92.69	1.71	81.20
32	2.38	76.19	1.05	79.01	1.22	93.91	1.71	82.91
33	2.38	78.57	1.00	80.01	1.11	95.02	1.71	84.62
34	2.38	80.95	.95	80.96	1.00	96.01	1.71	86.33
35	2.38	83.33	.91	81.87	.89	96.90	1.71	88.04
36	2.38	85.71	.86	82.73	.78	97.67	1.71	89.74
37	2.38	88.10	.82	83.56	.66	98.34	1.71	91.45
38	2.38	90.48	.78	84.34	.55	98.89	1.71	93.16
39	2.38	92.86	.75	85.09	.44	99.34	1.71	94.87
40	2.38	95.24	.71	85.80	.33	99.67	1.71	96.58
41	2.38	97.62	.68	86.47	.22	99.89	1.71	98.29
42	2.38	100.00	.64	87.12	.11	100.00	1.71	100.00

DEPRECIATION SCHEDULES--43 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %
1	2.33	2.33	4.65	4.65	4.55	4.55	4.65	4.65
2	2.33	4.65	4.43	9.09	4.44	8.99	4.43	9.09
3	2.33	6.98	4.23	13.31	4.33	13.32	4.23	13.31
4	2.33	9.30	4.03	17.35	4.23	17.55	4.03	17.35
5	2.33	11.63	3.84	21.19	4.12	21.67	3.84	21.19
6	2.33	13.95	3.67	24.86	4.02	25.69	3.67	24.86
7	2.33	16.28	3.50	28.35	3.91	29.60	3.50	28.35
8	2.33	18.60	3.33	31.68	3.81	33.40	3.33	31.68
9	2.33	20.93	3.18	34.86	3.70	37.10	3.18	34.86
10	2.33	23.26	3.03	37.89	3.59	40.70	3.03	37.89
11	2.33	25.58	2.89	40.78	3.49	44.19	2.89	40.78
12	2.33	27.91	2.75	43.53	3.38	47.57	2.75	43.53
13	2.33	30.23	2.63	46.16	3.28	50.85	2.63	46.16
14	2.33	32.56	2.50	48.66	3.17	54.02	2.50	48.66
15	2.33	34.88	2.39	51.05	3.07	57.08	2.39	51.05
16	2.33	37.21	2.28	53.33	2.96	60.04	2.28	53.33
17	2.33	39.53	2.17	55.50	2.85	62.90	2.17	55.50
18	2.33	41.86	2.07	57.57	2.75	65.64	2.07	57.57
19	2.33	44.19	1.97	59.54	2.64	68.29	1.97	59.54
20	2.33	46.51	1.88	61.42	2.54	70.82	1.88	61.42
21	2.33	48.84	1.79	63.22	2.43	73.26	1.79	63.22
22	2.33	51.16	1.71	64.93	2.33	75.58	1.71	64.93
23	2.33	53.49	1.63	66.56	2.22	77.80	1.67	66.60
24	2.33	55.81	1.56	68.12	2.11	79.92	1.67	68.27
25	2.33	58.14	1.48	69.60	2.01	81.92	1.67	69.94
26	2.33	60.47	1.41	71.01	1.90	83.83	1.67	71.61
27	2.33	62.79	1.35	72.36	1.80	85.62	1.67	73.28
28	2.33	65.12	1.29	73.65	1.69	87.32	1.67	74.95
29	2.33	67.44	1.23	74.87	1.59	88.90	1.67	76.62
30	2.33	69.77	1.17	76.04	1.48	90.38	1.67	78.29
31	2.33	72.09	1.11	77.16	1.37	91.75	1.67	79.96
32	2.33	74.42	1.06	78.22	1.27	93.02	1.67	81.63
33	2.33	76.74	1.01	79.23	1.16	94.19	1.67	83.30
34	2.33	79.07	.97	80.20	1.06	95.24	1.67	84.97
35	2.33	81.40	.92	81.12	.95	96.19	1.67	86.64
36	2.33	83.72	.88	82.00	.85	97.04	1.67	88.31
37	2.33	86.05	.84	82.83	.74	97.78	1.67	89.98
38	2.33	88.37	.80	83.63	.63	98.41	1.67	91.65
39	2.33	90.70	.76	84.39	.53	98.94	1.67	93.32
40	2.33	93.02	.73	85.12	.42	99.37	1.67	94.99
41	2.33	95.35	.69	85.81	.32	99.68	1.67	96.66
42	2.33	97.67	.66	86.47	.21	99.89	1.67	98.33
43	2.33	100.00	.63	87.10	.11	100.00	1.67	100.00

DEPRECIATION SCHEDULES--44 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %
1	2.27	2.27	4.55	4.55	4.44	4.44	4.55	4.55
2	2.27	4.55	4.34	8.88	4.34	8.79	4.34	8.88
3	2.27	6.82	4.14	13.03	4.24	13.03	4.14	13.03
4	2.27	9.09	3.95	16.98	4.14	17.17	3.95	16.98
5	2.27	11.36	3.77	20.75	4.04	21.21	3.77	20.75
6	2.27	13.64	3.60	24.36	3.94	25.15	3.60	24.36
7	2.27	15.91	3.44	27.79	3.84	28.99	3.44	27.79
8	2.27	18.18	3.28	31.08	3.74	32.73	3.28	31.08
9	2.27	20.45	3.13	34.21	3.64	36.36	3.13	34.21
10	2.27	22.73	2.99	37.20	3.54	39.90	2.99	37.20
11	2.27	25.00	2.85	40.05	3.43	43.33	2.85	40.05
12	2.27	27.27	2.72	42.78	3.33	46.67	2.72	42.78
13	2.27	29.55	2.60	45.38	3.23	49.90	2.60	45.38
14	2.27	31.82	2.48	47.86	3.13	53.03	2.48	47.86
15	2.27	34.09	2.37	50.23	3.03	56.06	2.37	50.23
16	2.27	36.36	2.26	52.49	2.93	58.99	2.26	52.49
17	2.27	38.64	2.16	54.65	2.83	61.82	2.16	54.65
18	2.27	40.91	2.06	56.71	2.73	64.55	2.06	56.71
19	2.27	43.18	1.97	58.68	2.63	67.17	1.97	58.68
20	2.27	45.45	1.88	60.56	2.53	69.70	1.88	60.56
21	2.27	47.73	1.79	62.35	2.42	72.12	1.79	52.35
22	2.27	50.00	1.71	64.06	2.32	74.44	1.71	64.06
23	2.27	52.27	1.63	65.70	2.22	76.67	1.63	65.70
24	2.27	54.55	1.56	67.26	2.12	78.79	1.63	67.33
25	2.27	56.82	1.49	68.75	2.02	80.81	1.63	68.96
26	2.27	59.09	1.42	70.17	1.92	82.73	1.63	70.60
27	2.27	61.36	1.36	71.52	1.82	84.55	1.63	72.23
28	2.27	63.64	1.29	72.82	1.72	86.26	1.63	73.86
29	2.27	65.91	1.24	74.05	1.62	87.88	1.63	75.50
30	2.27	68.18	1.18	75.23	1.52	89.39	1.63	77.13
31	2.27	70.45	1.13	76.36	1.41	90.81	1.63	78.77
32	2.27	72.73	1.07	77.43	1.31	92.12	1.63	80.40
33	2.27	75.00	1.03	78.46	1.21	93.33	1.63	82.03
34	2.27	77.27	.98	79.44	1.11	94.44	1.63	83.67
35	2.27	79.55	.93	80.37	1.01	95.45	1.63	85.30
36	2.27	81.82	.89	81.26	.91	96.36	1.63	86.93
37	2.27	84.09	.85	82.12	.81	97.17	1.63	88.57
38	2.27	86.36	.81	82.93	.71	97.88	1.63	90.20
39	2.27	88.64	.78	83.70	.61	98.48	1.63	91.83
40	2.27	90.91	.74	84.45	.51	98.99	1.63	93.47
41	2.27	93.18	.71	85.15	.40	99.39	1.63	95.10
42	2.27	95.45	.67	85.83	.30	99.70	1.63	96.73
43	2.27	97.73	.64	86.47	.20	99.90	1.63	98.37
44	2.27	100.00	.61	87.09	.10	100.00	1.63	100.00

DEPRECIATION SCHEDULES--45 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %
1	2.22	2.22	4.44	4.44	4.35	4.35	4.44	4.44
2	2.22	4.44	4.25	8.69	4.25	8.60	4.25	8.69
3	2.22	6.67	4.06	12.75	4.15	12.75	4.06	12.75
4	2.22	8.89	3.88	16.63	4.06	16.81	3.88	16.63
5	2.22	11.11	3.71	20.33	3.96	20.77	3.71	20.33
6	2.22	13.33	3.54	23.87	3.86	24.64	3.54	23.87
7	2.22	15.56	3.38	27.26	3.77	28.41	3.38	27.26
8	2.22	17.78	3.23	30.49	3.67	32.08	3.23	30.49
9	2.22	20.00	3.09	33.58	3.57	35.65	3.09	33.58
10	2.22	22.22	2.95	36.53	3.48	39.13	2.95	36.53
11	2.22	24.44	2.82	39.35	3.38	42.51	2.82	39.35
12	2.22	26.67	2.70	42.05	3.29	45.80	2.70	42.05
13	2.22	28.89	2.58	44.62	3.19	48.99	2.58	44.62
14	2.22	31.11	2.46	47.08	3.09	52.08	2.46	47.08
15	2.22	33.33	2.35	49.44	3.00	55.07	2.35	49.44
16	2.22	35.56	2.25	51.68	2.90	57.97	2.25	51.68
17	2.22	37.78	2.15	53.83	2.80	60.77	2.15	53.83
18	2.22	40.00	2.05	55.88	2.71	63.48	2.05	55.88
19	2.22	42.22	1.96	57.84	2.61	66.09	1.96	57.84
20	2.22	44.44	1.87	59.72	2.51	68.60	1.87	59.72
21	2.22	46.67	1.79	61.51	2.42	71.01	1.79	61.51
22	2.22	48.89	1.71	63.22	2.32	73.33	1.71	63.22
23	2.22	51.11	1.63	64.85	2.22	75.56	1.63	64.85
24	2.22	53.33	1.56	66.42	2.13	77.68	1.60	66.45
25	2.22	55.56	1.49	67.91	2.03	79.71	1.60	68.05
26	2.22	57.78	1.43	69.33	1.93	81.64	1.60	69.65
27	2.22	60.00	1.36	70.70	1.84	83.48	1.60	71.24
28	2.22	62.22	1.30	72.00	1.74	85.22	1.60	72.84
29	2.22	64.44	1.24	73.24	1.64	86.86	1.60	74.44
30	2.22	66.67	1.19	74.43	1.55	88.41	1.60	76.04
31	2.22	68.89	1.14	75.57	1.45	89.86	1.60	77.63
32	2.22	71.11	1.09	76.66	1.35	91.21	1.60	79.23
33	2.22	73.33	1.04	77.69	1.26	92.46	1.60	80.83
34	2.22	75.56	.99	78.68	1.16	93.62	1.60	82.43
35	2.22	77.78	.95	79.63	1.06	94.69	1.60	84.02
36	2.22	80.00	.91	80.54	.97	95.65	1.60	85.62
37	2.22	82.22	.87	81.40	.87	96.52	1.60	87.22
38	2.22	84.44	.83	82.23	.77	97.29	1.60	88.82
39	2.22	86.67	.79	83.02	.68	97.97	1.60	90.41
40	2.22	88.89	.75	83.77	.58	98.55	1.60	92.01
41	2.22	91.11	.72	84.49	.48	99.03	1.60	93.61
42	2.22	93.33	.69	85.18	.39	99.42	1.60	95.21
43	2.22	95.56	.66	85.84	.29	99.71	1.60	96.80
44	2.22	97.78	.63	86.47	.19	99.90	1.60	98.40
45	2.22	100.00	.60	87.07	.10	100.00	1.60	100.00

DEPRECIATION SCHEDULES--46 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %
1	2.17	2.17	4.35	4.35	4.26	4.26	4.35	4.35
2	2.17	4.35	4.16	8.51	4.16	8.42	4.16	8.51
3	2.17	6.52	3.98	12.48	4.07	12.49	3.98	12.48
4	2.17	8.70	3.81	16.29	3.98	16.47	3.81	16.29
5	2.17	10.87	3.64	19.93	3.89	20.35	3.64	19.93
6	2.17	13.04	3.48	23.41	3.79	24.14	3.48	23.41
7	2.17	15.22	3.33	26.74	3.70	27.84	3.33	26.74
8	2.17	17.39	3.19	29.93	3.61	31.45	3.19	29.93
9	2.17	19.57	3.05	32.97	3.52	34.97	3.05	32.97
10	2.17	21.74	2.91	35.89	3.42	38.39	2.91	35.89
11	2.17	23.91	2.79	38.67	3.33	41.72	2.79	38.67
12	2.17	26.09	2.67	41.34	3.24	44.96	2.67	41.34
13	2.17	28.26	2.55	43.89	3.15	48.10	2.55	43.89
14	2.17	30.43	2.44	46.33	3.05	51.16	2.44	46.33
15	2.17	32.61	2.33	48.66	2.96	54.12	2.33	48.66
16	2.17	34.78	2.23	50.90	2.87	56.98	2.23	50.90
17	2.17	36.96	2.13	53.03	2.78	59.76	2.13	53.03
18	2.17	39.13	2.04	55.07	2.68	62.44	2.04	55.07
19	2.17	41.30	1.95	57.03	2.59	65.03	1.95	57.03
20	2.17	43.48	1.87	58.89	2.50	67.53	1.87	58.89
21	2.17	45.65	1.79	60.68	2.41	69.94	1.79	60.68
22	2.17	47.83	1.71	62.39	2.31	72.25	1.71	62.39
23	2.17	50.00	1.64	64.03	2.22	74.47	1.64	64.03
24	2.17	52.17	1.56	65.59	2.13	76.60	1.56	65.59
25	2.17	54.35	1.50	67.09	2.04	78.63	1.56	67.15
26	2.17	56.52	1.43	68.52	1.94	80.57	1.56	68.72
27	2.17	58.70	1.37	69.89	1.85	82.42	1.56	70.28
28	2.17	60.87	1.31	71.20	1.76	84.18	1.56	71.85
29	2.17	63.04	1.25	72.45	1.67	85.85	1.56	73.41
30	2.17	65.22	1.20	73.65	1.57	87.42	1.56	74.98
31	2.17	67.39	1.15	74.79	1.48	88.90	1.56	76.54
32	2.17	69.57	1.10	75.89	1.39	90.29	1.56	78.10
33	2.17	71.74	1.05	76.94	1.30	91.58	1.56	79.67
34	2.17	73.91	1.00	77.94	1.20	92.78	1.56	81.23
35	2.17	76.09	.96	78.90	1.11	93.89	1.56	82.80
36	2.17	78.26	.92	79.82	1.02	94.91	1.56	84.36
37	2.17	80.43	.88	80.69	.93	95.84	1.56	85.92
38	2.17	82.61	.84	81.53	.83	96.67	1.56	87.49
39	2.17	84.78	.80	82.34	.74	97.41	1.56	89.05
40	2.17	86.96	.77	83.10	.65	98.06	1.56	90.62
41	2.17	89.13	.73	83.84	.56	98.61	1.56	92.18
42	2.17	91.30	.70	84.54	.46	99.07	1.56	93.74
43	2.17	93.48	.67	85.21	.37	99.44	1.56	95.31
44	2.17	95.65	.64	85.86	.28	99.72	1.56	96.87
45	2.17	97.83	.61	86.47	.19	99.91	1.56	98.44
46	2.17	100.00	.59	87.06	.09	100.00	1.56	100.00

DEPRECIATION SCHEDULES--47 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %
1	2.13	2.13	4.26	4.26	4.17	4.17	4.26	4.26
2	2.13	4.26	4.07	8.33	4.08	8.24	4.07	8.33
3	2.13	6.38	3.90	12.23	3.99	12.23	3.90	12.23
4	2.13	8.51	3.73	15.97	3.90	16.13	3.73	15.97
5	2.13	10.64	3.58	19.54	3.81	19.95	3.58	19.54
6	2.13	12.77	3.42	22.97	3.72	23.67	3.42	22.97
7	2.13	14.89	3.28	26.24	3.63	27.30	3.28	26.24
8	2.13	17.02	3.14	29.38	3.55	30.85	3.14	29.38
9	2.13	19.15	3.01	32.39	3.46	34.31	3.01	32.39
10	2.13	21.28	2.88	35.26	3.37	37.68	2.88	35.26
11	2.13	23.40	2.75	38.02	3.28	40.96	2.75	38.02
12	2.13	25.53	2.64	40.66	3.19	44.15	2.64	40.66
13	2.13	27.66	2.53	43.18	3.10	47.25	2.53	43.18
14	2.13	29.79	2.42	45.60	3.01	50.27	2.42	45.60
15	2.13	31.91	2.31	47.91	2.93	53.19	2.31	47.91
16	2.13	34.04	2.22	50.13	2.84	56.03	2.22	50.13
17	2.13	36.17	2.12	52.25	2.75	58.78	2.12	52.25
18	2.13	38.30	2.03	54.28	2.66	61.44	2.03	54.28
19	2.13	40.43	1.95	56.23	2.57	64.01	1.95	56.23
20	2.13	42.55	1.86	58.09	2.48	66.49	1.86	58.09
21	2.13	44.68	1.78	59.88	2.39	68.88	1.78	59.88
22	2.13	46.81	1.71	61.58	2.30	71.19	1.71	61.58
23	2.13	48.94	1.63	63.22	2.22	73.40	1.63	63.22
24	2.13	51.06	1.57	64.78	2.13	75.53	1.57	64.78
25	2.13	53.19	1.50	66.28	2.04	77.57	1.53	66.31
26	2.13	55.32	1.43	67.72	1.95	79.52	1.53	67.85
27	2.13	57.45	1.37	69.09	1.86	81.38	1.53	69.38
28	2.13	59.57	1.32	70.41	1.77	83.16	1.53	70.91
29	2.13	61.70	1.26	71.66	1.68	84.84	1.53	72.44
30	2.13	63.83	1.21	72.87	1.60	86.44	1.53	73.97
31	2.13	65.96	1.15	74.03	1.51	87.94	1.53	75.50
32	2.13	68.09	1.11	75.13	1.42	89.36	1.53	77.03
33	2.13	70.21	1.06	76.19	1.33	90.69	1.53	78.56
34	2.13	72.34	1.01	77.20	1.24	91.93	1.53	80.09
35	2.13	74.47	.97	78.17	1.15	93.09	1.53	81.63
36	2.13	76.60	.93	79.10	1.06	94.15	1.53	83.16
37	2.13	78.72	.89	79.99	.98	95.12	1.53	84.69
38	2.13	80.85	.85	80.84	.89	96.01	1.53	86.22
39	2.13	82.98	.82	81.66	.80	96.81	1.53	87.75
40	2.13	85.11	.78	82.44	.71	97.52	1.53	89.28
41	2.13	87.23	.75	83.18	.62	98.14	1.53	90.81
42	2.13	89.36	.72	83.90	.53	98.67	1.53	92.34
43	2.13	91.49	.69	84.59	.44	99.11	1.53	93.88
44	2.13	93.62	.66	85.24	.35	99.47	1.53	95.41
45	2.13	95.74	.63	85.87	.27	99.73	1.53	96.94
46	2.13	97.87	.60	86.47	.18	99.91	1.53	98.47
47	2.13	100.00	.58	87.05	.09	100.00	1.53	100.00

DEPRECIATION SCHEDULES--48 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %	%/YEAR	CUMULATIVE %
1	2.08	2.08	4.17	4.17	4.08	4.08	4.17	4.17
2	2.08	4.17	3.99	8.16	4.00	8.08	3.99	8.16
3	2.08	6.25	3.83	11.99	3.91	11.99	3.83	11.99
4	2.08	8.33	3.67	15.65	3.83	15.82	3.67	15.65
5	2.08	10.42	3.51	19.17	3.74	19.56	3.51	19.17
6	2.08	12.50	3.37	22.54	3.66	23.21	3.37	22.54
7	2.08	14.58	3.23	25.76	3.57	26.79	3.23	25.76
8	2.08	16.67	3.09	28.86	3.49	30.27	3.09	28.86
9	2.08	18.75	2.96	31.82	3.40	33.67	2.96	31.82
10	2.08	20.83	2.84	34.66	3.32	36.99	2.84	34.66
11	2.08	22.92	2.72	37.38	3.23	40.22	2.72	37.38
12	2.08	25.00	2.61	39.99	3.15	43.37	2.61	39.99
13	2.08	27.08	2.50	42.49	3.06	46.43	2.50	42.49
14	2.08	29.17	2.40	44.89	2.98	49.40	2.40	44.89
15	2.08	31.25	2.30	47.19	2.89	52.30	2.30	47.19
16	2.08	33.33	2.20	49.39	2.81	55.10	2.20	49.39
17	2.08	35.42	2.11	51.50	2.72	57.82	2.11	51.50
18	2.08	37.50	2.02	53.52	2.64	60.46	2.02	53.52
19	2.08	39.58	1.94	55.45	2.55	63.01	1.94	55.45
20	2.08	41.67	1.86	57.31	2.47	65.48	1.86	57.31
21	2.08	43.75	1.78	59.09	2.38	67.85	1.78	59.09
22	2.08	45.83	1.70	60.79	2.30	70.15	1.70	60.79
23	2.08	47.92	1.63	62.43	2.21	72.36	1.63	62.43
24	2.08	50.00	1.57	63.99	2.13	74.49	1.57	63.99
25	2.08	52.08	1.50	65.49	2.04	76.53	1.50	65.49
26	2.08	54.17	1.44	66.93	1.96	78.49	1.50	66.99
27	2.08	56.25	1.38	68.31	1.87	80.36	1.50	68.49
28	2.08	58.33	1.32	69.63	1.79	82.14	1.50	69.99
29	2.08	60.42	1.27	70.89	1.70	83.84	1.50	71.49
30	2.08	62.50	1.21	72.11	1.62	85.46	1.50	72.99
31	2.08	64.58	1.16	73.27	1.53	86.99	1.50	74.49
32	2.08	66.67	1.11	74.38	1.45	88.44	1.50	75.99
33	2.08	68.75	1.07	75.45	1.36	89.80	1.50	77.50
34	2.08	70.83	1.02	76.47	1.28	91.07	1.50	79.00
35	2.08	72.92	.98	77.45	1.19	92.26	1.50	80.50
36	2.08	75.00	.94	78.39	1.11	93.37	1.50	82.00
37	2.08	77.08	.90	79.29	1.02	94.39	1.50	83.50
38	2.08	79.17	.86	80.16	.94	95.32	1.50	85.00
39	2.08	81.25	.83	80.98	.85	96.17	1.50	86.50
40	2.08	83.33	.79	81.78	.77	96.94	1.50	88.00
41	2.08	85.42	.76	82.53	.68	97.62	1.50	89.50
42	2.08	87.50	.73	83.26	.60	98.21	1.50	91.00
43	2.08	89.58	.70	83.96	.51	98.72	1.50	92.50
44	2.08	91.67	.67	84.63	.43	99.15	1.50	94.00
45	2.08	93.75	.64	85.27	.34	99.49	1.50	95.50
46	2.08	95.83	.61	85.88	.26	99.74	1.50	97.00
47	2.08	97.92	.59	86.47	.17	99.91	1.50	98.50
48	2.08	100.00	.56	87.03	.09	100.00	1.50	100.00

DEPRECIATION SCHEDULES--49 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %	%/YEAR	CUMULA-TIVE %
1	2.04	2.04	4.08	4.08	4.00	4.00	4.08	4.08
2	2.04	4.08	3.92	8.00	3.92	7.92	3.92	8.00
3	2.04	6.12	3.76	11.75	3.84	11.76	3.76	11.75
4	2.04	8.16	3.60	15.35	3.76	15.51	3.60	15.35
5	2.04	10.20	3.45	18.81	3.67	19.18	3.45	18.81
6	2.04	12.24	3.31	22.12	3.59	22.78	3.31	22.12
7	2.04	14.29	3.18	25.30	3.51	26.29	3.18	25.30
8	2.04	16.33	3.05	28.35	3.43	29.71	3.05	28.35
9	2.04	18.37	2.92	31.27	3.35	33.06	2.92	31.27
10	2.04	20.41	2.81	34.08	3.27	36.33	2.81	34.08
11	2.04	22.45	2.69	36.77	3.18	39.51	2.69	36.77
12	2.04	24.49	2.58	39.35	3.10	42.61	2.58	39.35
13	2.04	26.53	2.48	41.83	3.02	45.63	2.48	41.83
14	2.04	28.57	2.37	44.20	2.94	48.57	2.37	44.20
15	2.04	30.61	2.28	46.48	2.86	51.43	2.28	46.48
16	2.04	32.65	2.18	48.66	2.78	54.20	2.18	48.66
17	2.04	34.69	2.10	50.76	2.69	56.90	2.10	50.76
18	2.04	36.73	2.01	52.77	2.61	59.51	2.01	52.77
19	2.04	38.78	1.93	54.70	2.53	62.04	1.93	54.70
20	2.04	40.82	1.85	56.55	2.45	64.49	1.85	56.55
21	2.04	42.86	1.77	58.32	2.37	65.86	1.77	58.32
22	2.04	44.90	1.70	60.02	2.29	69.14	1.70	60.02
23	2.04	46.94	1.63	61.65	2.20	71.35	1.63	61.65
24	2.04	48.98	1.57	63.22	2.12	73.47	1.57	63.22
25	2.04	51.02	1.50	64.72	2.04	75.51	1.50	64.72
26	2.04	53.06	1.44	66.16	1.96	77.47	1.47	66.19
27	2.04	55.10	1.38	67.54	1.88	79.35	1.47	67.66
28	2.04	57.14	1.32	68.86	1.80	81.14	1.47	69.13
29	2.04	59.18	1.27	70.14	1.71	82.86	1.47	70.60
30	2.04	61.22	1.22	71.35	1.63	84.49	1.47	72.07
31	2.04	63.27	1.17	72.52	1.55	86.04	1.47	73.54
32	2.04	65.31	1.12	73.65	1.47	87.51	1.47	75.01
33	2.04	67.35	1.08	74.72	1.39	88.90	1.47	76.48
34	2.04	69.39	1.03	75.75	1.31	90.20	1.47	77.95
35	2.04	71.43	.99	76.74	1.22	91.43	1.47	79.42
36	2.04	73.47	.95	77.69	1.14	92.57	1.47	80.89
37	2.04	75.51	.91	78.60	1.06	93.63	1.47	82.36
38	2.04	77.55	.87	79.48	.98	94.61	1.47	83.83
39	2.04	79.59	.84	80.31	.90	95.51	1.47	85.30
40	2.04	81.63	.80	81.12	.82	96.33	1.47	86.77
41	2.04	83.67	.77	81.89	.73	97.06	1.47	88.24
42	2.04	85.71	.74	82.63	.65	97.71	1.47	89.71
43	2.04	87.76	.71	83.34	.57	98.29	1.47	91.18
44	2.04	89.80	.68	84.02	.49	98.78	1.47	92.65
45	2.04	91.84	.65	84.67	.41	99.18	1.47	94.12
46	2.04	93.88	.63	85.29	.33	99.51	1.47	95.59
47	2.04	95.92	.60	85.89	.24	99.76	1.47	97.06
48	2.04	97.96	.58	86.47	.16	99.92	1.47	98.53
49	2.04	100.00	.55	87.02	.08	100.00	1.47	100.00

DEPRECIATION SCHEDULES--50 YEAR LIFETIME

YEAR	STRAIGHT LINE		DOUBLE DECLINING		SUM OF DIGITS		DOUBLE DECLINING /STRAIGHT LINE	
	%/YEAR	CUMULA- TIVE %	%/YEAR	CUMULA- TIVE %	%/YEAR	CUMULA- TIVE %	%/YEAR	CUMULA- TIVE %
1	2.00	2.00	4.00	4.00	3.92	3.92	4.00	4.00
2	2.00	4.00	3.84	7.84	3.84	7.76	3.84	7.84
3	2.00	6.00	3.69	11.53	3.76	11.53	3.69	11.53
4	2.00	8.00	3.54	15.07	3.69	15.22	3.54	15.07
5	2.00	10.00	3.40	18.46	3.61	18.82	3.40	18.46
6	2.00	12.00	3.26	21.72	3.53	22.35	3.26	21.72
7	2.00	14.00	3.13	24.86	3.45	25.80	3.13	24.86
8	2.00	16.00	3.01	27.86	3.37	29.18	3.01	27.86
9	2.00	18.00	2.89	30.75	3.29	32.47	2.89	30.75
10	2.00	20.00	2.77	33.52	3.22	35.69	2.77	33.52
11	2.00	22.00	2.66	36.18	3.14	38.82	2.66	36.18
12	2.00	24.00	2.55	38.73	3.06	41.88	2.55	38.73
13	2.00	26.00	2.45	41.18	2.98	44.86	2.45	41.18
14	2.00	28.00	2.35	43.53	2.90	47.76	2.35	43.53
15	2.00	30.00	2.26	45.79	2.82	50.59	2.26	45.79
16	2.00	32.00	2.17	47.96	2.75	53.33	2.17	47.96
17	2.00	34.00	2.08	50.04	2.67	56.00	2.08	50.04
18	2.00	36.00	2.00	52.04	2.59	58.59	2.00	52.04
19	2.00	38.00	1.92	53.96	2.51	61.10	1.92	53.96
20	2.00	40.00	1.84	55.80	2.43	63.53	1.84	55.80
21	2.00	42.00	1.77	57.57	2.35	65.88	1.77	57.57
22	2.00	44.00	1.70	59.27	2.27	68.16	1.70	59.27
23	2.00	46.00	1.63	60.89	2.20	70.35	1.63	60.89
24	2.00	48.00	1.56	62.46	2.12	72.47	1.56	62.46
25	2.00	50.00	1.50	63.96	2.04	74.51	1.50	63.96
26	2.00	52.00	1.44	65.40	1.96	76.47	1.44	65.40
27	2.00	54.00	1.38	66.79	1.88	78.35	1.44	66.84
28	2.00	56.00	1.33	68.11	1.80	80.16	1.44	68.29
29	2.00	58.00	1.28	69.39	1.73	81.88	1.44	69.73
30	2.00	60.00	1.22	70.61	1.65	83.53	1.44	71.17
31	2.00	62.00	1.18	71.79	1.57	85.10	1.44	72.61
32	2.00	64.00	1.13	72.92	1.49	86.59	1.44	74.05
33	2.00	66.00	1.08	74.00	1.41	88.00	1.44	75.49
34	2.00	68.00	1.04	75.04	1.33	89.33	1.44	76.93
35	2.00	70.00	1.00	76.04	1.25	90.59	1.44	78.38
36	2.00	72.00	.96	77.00	1.18	91.76	1.44	79.82
37	2.00	74.00	.92	77.92	1.10	92.86	1.44	81.26
38	2.00	76.00	.88	78.80	1.02	93.88	1.44	82.70
39	2.00	78.00	.85	79.65	.94	94.82	1.44	84.14
40	2.00	80.00	.81	80.46	.86	95.69	1.44	85.58
41	2.00	82.00	.78	81.24	.78	96.47	1.44	87.03
42	2.00	84.00	.75	82.00	.71	97.18	1.44	88.47
43	2.00	86.00	.72	82.72	.63	97.80	1.44	89.91
44	2.00	88.00	.69	83.41	.55	98.35	1.44	91.35
45	2.00	90.00	.66	84.07	.47	98.82	1.44	92.79
46	2.00	92.00	.64	84.71	.39	99.22	1.44	94.23
47	2.00	94.00	.61	85.32	.31	99.53	1.44	95.68
48	2.00	96.00	.59	85.91	.24	99.76	1.44	97.12
49	2.00	98.00	.56	86.47	.16	99.92	1.44	98.56
50	2.00	100.00	.54	87.01	.08	100.00	1.44	100.00

APPENDIX D

VALUES OF DISCOUNTED TAX CREDIT RATE

DISCOUNTED TAX CREDIT
STRAIGHT LINE DEPRECIATION

INTEREST RATE
(% PER YEAR)

DEPRECIATION PERIOD

YEARS	.00	.25	.50	.75	1.00	1.25	1.50	1.75	2.00	2.25
3	1.00000	.99502	.99008	.98518	.98033	.97551	.97073	.96599	.96129	.95663
4	1.00000	.99378	.98762	.98153	.97549	.96951	.96360	.95774	.95193	.94618
5	1.00000	.99254	.98517	.97789	.97068	.96357	.95653	.94957	.94269	.93589
6	1.00000	.99130	.98273	.97426	.96591	.95767	.94953	.94150	.93357	.92575
7	1.00000	.99007	.98029	.97066	.96117	.95182	.94260	.93352	.92457	.91575
8	1.00000	.98884	.97787	.96707	.95646	.94601	.93574	.92563	.91568	.90590
9	1.00000	.98761	.97545	.96351	.95178	.94026	.92895	.91783	.90691	.89619
10	1.00000	.98638	.97304	.95996	.94713	.93455	.92222	.91012	.89826	.88662
11	1.00000	.98516	.97064	.95642	.94251	.92889	.91556	.90250	.88971	.87719
12	1.00000	.98393	.96824	.95291	.93792	.92327	.90896	.89496	.88128	.86790
13	1.00000	.98271	.96586	.94941	.93336	.91771	.90242	.88751	.87295	.85874
14	1.00000	.98149	.96348	.94593	.92883	.91218	.89595	.88014	.86473	.84971
15	1.00000	.98028	.96111	.94246	.92434	.90670	.88955	.87286	.85662	.84081
16	1.00000	.97906	.95874	.93902	.91987	.90127	.88320	.86566	.84861	.83204
17	1.00000	.97785	.95639	.93559	.91543	.89588	.87692	.85853	.84070	.82339
18	1.00000	.97664	.95404	.93217	.91101	.89053	.87070	.85149	.83289	.81487
19	1.00000	.97543	.95170	.92878	.90663	.88523	.86453	.84453	.82518	.80647
20	1.00000	.97422	.94937	.92540	.90228	.87996	.85843	.83764	.81757	.79819
21	1.00000	.97302	.94704	.92204	.89795	.87475	.85239	.83084	.81006	.79002
22	1.00000	.97181	.94473	.91869	.89365	.86957	.84640	.82410	.80264	.78197
23	1.00000	.97061	.94242	.91536	.88938	.86444	.84047	.81745	.79531	.77403
24	1.00000	.96941	.94012	.91205	.88514	.85934	.83460	.81086	.78808	.76621
25	1.00000	.96821	.93782	.90875	.88092	.85429	.82878	.80435	.78094	.75850
26	1.00000	.96702	.93554	.90547	.87674	.84928	.82302	.79791	.77389	.75089
27	1.00000	.95583	.93326	.90220	.67258	.84431	.81732	.79155	.76692	.74339
28	1.00000	.96463	.93099	.89895	.86844	.83937	.81167	.78525	.76005	.73599
29	1.00000	.96345	.92872	.89572	.86434	.83448	.80607	.77902	.75325	.72870
30	1.00000	.96226	.92647	.89250	.86026	.82963	.80053	.77286	.74655	.72151
31	1.00000	.96107	.92422	.88930	.85620	.82481	.79504	.76677	.73993	.71442
32	1.00000	.95989	.92198	.88611	.85217	.82004	.78960	.76075	.73339	.70743
33	1.00000	.95871	.91974	.88294	.84817	.81530	.78421	.75479	.72693	.70053
34	1.00000	.95753	.91751	.87979	.84419	.81060	.77887	.74889	.72055	.89373
35	1.00000	.95635	.91529	.87665	.84024	.80594	.77359	.74306	.71425	.68702
36	1.00000	.95518	.91308	.87352	.83632	.80131	.76835	.73730	.70802	.68041
37	1.00000	.95400	.91088	.87041	.83242	.79672	.76316	.73160	.70188	.67388
38	1.00000	.95283	.90868	.86732	.82854	.79217	.75803	.72595	.69581	.66745
39	1.00000	.95166	.90649	.86424	.82469	.78765	.75294	.72037	.68981	.66110
40	1.00000	.95049	.90430	.86117	.82087	.78317	.74790	.71486	.68389	.65484
41	1.00000	.94933	.90213	.85812	.81706	.77873	.74290	.70940	.67804	.64866
42	1.00000	.94816	.89996	.85509	.81329	.77432	.73795	.70400	.67226	.64257
43	1.00000	.94700	.89780	.85207	.80953	.76994	.73305	.69865	.66655	.63656
44	1.00000	.94584	.89564	.84906	.80580	.76560	.72820	.69337	.66091	.63063
45	1.00000	.94468	.89349	.84607	.80210	.76129	.72338	.68814	.65534	.62478
46	1.00000	.94353	.89135	.84309	.79842	.75702	.71862	.68297	.64983	.61901
47	1.00000	.94237	.88922	.84013	.79476	.75278	.71390	.67785	.64440	.61332
48	1.00000	.94122	.88709	.83718	.79112	.74857	.70922	.67279	.63902	.60770
49	1.00000	.94007	.88497	.83425	.78751	.74440	.70458	.66778	.63372	.60216
50	1.00000	.93892	.88285	.83133	.78392	.74026	.69999	.66282	.62847	.59669

DISCOUNTED TAX CREDIT
STRAIGHT LINE DEPRECIATION

DEPRECIATION PERIOD

	INTEREST RATE (% PER YEAR)									
YEARS :	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75
3	.95201	.94742	.94287	.93836	.93388	.92944	.92503	.92066	.91632	.91202
4	.94049	.93486	.92927	.92375	.91827	.91285	.90747	.90215	.89688	.89166
5	.92917	.92252	.91594	.90944	.90301	.89665	.89036	.88415	.87800	.87191
6	.91802	.91039	.90286	.89543	.88809	.88085	.87369	.86662	.85965	.85275
7	.90706	.89849	.89004	.88171	.87351	.86541	.85744	.84957	.84181	.83417
8	.89627	.88679	.87746	.86828	.85924	.85035	.84159	.83297	.82449	.81613
9	.88565	.87530	.86512	.85512	.84530	.83564	.82615	.81682	.80764	.79862
10	.87521	.86401	.85302	.84224	.83166	.82128	.81109	.80109	.79127	.78163
11	.86495	.85292	.84115	.82962	.81832	.80725	.79641	.78578	.77536	.76514
12	.85481	.84202	.82950	.81726	.80528	.79356	.78209	.77087	.75988	.74913
13	.84486	.83131	.81807	.80515	.79252	.78018	.76813	.75635	.74483	.73358
14	.83506	.82079	.80686	.79328	.78004	.76712	.75451	.74221	.73020	.71848
15	.82542	.81045	.79586	.78166	.76783	.75435	.74123	.72843	.71597	.70382
16	.81594	.80029	.78507	.77027	.75588	.74189	.72827	.71502	.70213	.68958
17	.80660	.79030	.77448	.75911	.74420	.72970	.71563	.70195	.68866	.67574
18	.79741	.78049	.76408	.74818	.73276	.71780	.70329	.68922	.67555	.66229
19	.78836	.77084	.75388	.73747	.72157	.70617	.69126	.67681	.66280	.64923
20	.77946	.76136	.74387	.72697	.71062	.69481	.67952	.66472	.65040	.63653
21	.77069	.75204	.73405	.71668	.69990	.68370	.66806	.65293	.63832	.62419
22	.76206	.74289	.72440	.70659	.68941	.67285	.65687	.64145	.62656	.61220
23	.75357	.73388	.71494	.69670	.67915	.66224	.64595	.63025	.61512	.60053
24	.74521	.72503	.70565	.68701	.66910	.65187	.63529	.61934	.60398	.58919
25	.73697	.71633	.69653	.67751	.65926	.64173	.62488	.60869	.59313	.57816
26	.72887	.70778	.68757	.66820	.64963	.63181	.61472	.59832	.58256	.56743
27	.72089	.69937	.67878	.65907	.64020	.62212	.60480	.58819	.57227	.55699
28	.71305	.69110	.67015	.65012	.63096	.61264	.59511	.57832	.56225	.54684
29	.70529	.68297	.66167	.64134	.62192	.60337	.58565	.56869	.55248	.53696
30	.69768	.67498	.65335	.63273	.61307	.59431	.57640	.55930	.54296	.52735
31	.69017	.66712	.64517	.62429	.60440	.58544	.56737	.55014	.53369	.51799
32	.68279	.65939	.63715	.61601	.59590	.57677	.55855	.54119	.52465	.50888
33	.67551	.65178	.62927	.60789	.58758	.56828	.54993	.53247	.51584	.50001
34	.66835	.64431	.62152	.59992	.57943	.55998	.54151	.52395	.50726	.49138
35	.66129	.63695	.61392	.59211	.57145	.55186	.53327	.51564	.49889	.48297
36	.65434	.62972	.60645	.58445	.56362	.54391	.52523	.50752	.49072	.47478
37	.64749	.62261	.59911	.57693	.55596	.53613	.51737	.49960	.48276	.46680
38	.64075	.61561	.59191	.56955	.54845	.52852	.50968	.49186	.47500	.45903
39	.63411	.60872	.58483	.56231	.54109	.52107	.50217	.48431	.46743	.45146
40	.62757	.60195	.57787	.55521	.53388	.51377	.49482	.47693	.46004	.44408
41	.62112	.59529	.57103	.54824	.52681	.50664	.48764	.46973	.45283	.43688
42	.61478	.58874	.56432	.54140	.51988	.49965	.48061	.46269	.44580	.42987
43	.60852	.58229	.55772	.53469	.51309	.49280	.47374	.45581	.43894	.42304
44	.60236	.57594	.55123	.52810	.50643	.48610	.46702	.44909	.43224	.41637
45	.59629	.56970	.54486	.52164	.49990	.47954	.46045	.44253	.42570	.40987
46	.59031	.56356	.53860	.51529	.49350	.47311	.45401	.43611	.41931	.40353
47	.58441	.55751	.53244	.50906	.48722	.46681	.44772	.42984	.41308	.39735
48	.57861	.55156	.52639	.50294	.48107	.46065	.44157	.42371	.40699	.39132
49	.57286	.54571	.52044	.49693	.47503	.45461	.43554	.41772	.40105	.38543
50	.56725	.53994	.51460	.49104	.46911	.44869	.42964	.41186	.39524	.37969

DISCOUNTED TAX CREDIT
STRAIGHT LINE DEPRECIATION

INTEREST RATE
(% PER YEAR)

DEPRECIATION PERIOD

YEARS	5.00	5.25	5.50	5.75	6.00	6.25	6.50	6.75	7.00	7.25
3	.90775	.90351	.89931	.89514	.89100	.88690	.88283	.87878	.87477	.87079
4	.88649	.88136	.87629	.87126	.86628	.86134	.85645	.85160	.84680	.84205
5	.86590	.85994	.85406	.84823	.84247	.83677	.83114	.82556	.82004	.81458
6	.84595	.83923	.83259	.82603	.81955	.81316	.80684	.80059	.79442	.78833
7	.82662	.81919	.81185	.80462	.79748	.79044	.78350	.77665	.76990	.76323
8	.80790	.79980	.79182	.78396	.77622	.76860	.76109	.75370	.74641	.73923
9	.78976	.78104	.77247	.76404	.75574	.74759	.73957	.73168	.72391	.71628
10	.77217	.76288	.75376	.74481	.73601	.72737	.71888	.71055	.70236	.69431
11	.75513	.74531	.73569	.72625	.71699	.70791	.69900	.69027	.68170	.67329
12	.73860	.72830	.71821	.70833	.69865	.68918	.67989	.67080	.66189	.65316
13	.72256	.71183	.70131	.69103	.68098	.67114	.66152	.65211	.64290	.63388
14	.70703	.69588	.68497	.67433	.66393	.65377	.64385	.63415	.62468	.61542
15	.69196	.68043	.66917	.65819	.64748	.63704	.62684	.61690	.60719	.59772
16	.67736	.66547	.65389	.64261	.63162	.62091	.61049	.60032	.59042	.58076
17	.66318	.65097	.63909	.62754	.61631	.60538	.59474	.58439	.57431	.56449
18	.64942	.63692	.62478	.61299	.60153	.59040	.57958	.56906	.55884	.54889
19	.63607	.62331	.61093	.59892	.58727	.57596	.56498	.55433	.54398	.53393
20	.62311	.61011	.59752	.58532	.57350	.56204	.55093	.54015	.52970	.51956
21	.61053	.59732	.58454	.57217	.56019	.54860	.53738	.52651	.51598	.50577
22	.59832	.58491	.57196	.55945	.54734	.53564	.52433	.51338	.50278	.49253
23	.58646	.57288	.55978	.54714	.53493	.52314	.51175	.50074	.49010	.47981
24	.57494	.56122	.54799	.53523	.52293	.51106	.49961	.48856	.47789	.46758
25	.56376	.54990	.53656	.52371	.51133	.49941	.48792	.47683	.46614	.45583
26	.55289	.53892	.52548	.51256	.50012	.48815	.47663	.46553	.45484	.44453
27	.54233	.52826	.51474	.50176	.48928	.47728	.46574	.45464	.44395	.43366
28	.53208	.51792	.50434	.49130	.47879	.46678	.45523	.44414	.43347	.42321
29	.52211	.50785	.49424	.48118	.46865	.45662	.44509	.43401	.42337	.41314
30	.51242	.49813	.48446	.47137	.45883	.44681	.43529	.42424	.41363	.40346
31	.50299	.48866	.47497	.46186	.44933	.43732	.42583	.41481	.40425	.39412
32	.49383	.47947	.46576	.45265	.44013	.42815	.41669	.40571	.39520	.38514
33	.48493	.47054	.45682	.44372	.43122	.41927	.40785	.39693	.38648	.37647
34	.47626	.46187	.44815	.43507	.42259	.41068	.39931	.38845	.37806	.36812
35	.46783	.45344	.43973	.42668	.41424	.40237	.39106	.38025	.36993	.36007
36	.45963	.44524	.43156	.41854	.40614	.39433	.38307	.37233	.36209	.35231
37	.45166	.43728	.42362	.41064	.39829	.38654	.37535	.36468	.35451	.34481
38	.44389	.42954	.41591	.40298	.39068	.37900	.36787	.35728	.34720	.33758
39	.43633	.42201	.40843	.39554	.38331	.37169	.36064	.35013	.34013	.33060
40	.42896	.41469	.40115	.38832	.37616	.36461	.35364	.34321	.33329	.32385
41	.42181	.40757	.39408	.38132	.36922	.35775	.34686	.33652	.32669	.31734
42	.41484	.40064	.38721	.37451	.36249	.35109	.34029	.33004	.32030	.31104
43	.40804	.39390	.38054	.36791	.35596	.34465	.33393	.32376	.31412	.30495
44	.40143	.38734	.37404	.36149	.34962	.33839	.32776	.31769	.30813	.29907
45	.39496	.38095	.36773	.35525	.34346	.33232	.32178	.31180	.30234	.29337
46	.38870	.37474	.36159	.34919	.33749	.32644	.31599	.30610	.29674	.28787
47	.38257	.36868	.35561	.34329	.33168	.32072	.31037	.30058	.29131	.28253
48	.37661	.36279	.34980	.33757	.32604	.31517	.30491	.29522	.28605	.27737
49	.37079	.35705	.34414	.33199	.32056	.30979	.29962	.29003	.28096	.27237
50	.36512	.35146	.33863	.32658	.31524	.30456	.29449	.28499	.27601	.26753

DISCOUNTED TAX CREDIT
STRAIGHT LINE DEPRECIATION

INTEREST RATE
(% PER YEAR)

DEPRECIATION PERIOD

YEARS	7.50	7.75	8.00	8.25	8.50	8.75	9.00	9.25	9.50	9.75
3	.86684	.86292	.85903	.85517	.85134	.84754	.84376	.84002	.83630	.83261
4	.83735	.83266	.82803	.82344	.81890	.81439	.80993	.80551	.80112	.79677
5	.80916	.80383	.79854	.79331	.78813	.78300	.77793	.77291	.76794	.76302
6	.78231	.77636	.77048	.76467	.75893	.75326	.74765	.74211	.73664	.73123
7	.75660	.75017	.74377	.73745	.73122	.72506	.71899	.71300	.70709	.70125
8	.73216	.72520	.71833	.71156	.70490	.69833	.69185	.68547	.67918	.67298
9	.70877	.70137	.69410	.68694	.67990	.67296	.66614	.65942	.65281	.64630
10	.68641	.67864	.67101	.66351	.65613	.64889	.64177	.63476	.62788	.62111
11	.66504	.65694	.64900	.64120	.63354	.62603	.61865	.61141	.60430	.59732
12	.64461	.63622	.62801	.61995	.61206	.60432	.59673	.58928	.58199	.57483
13	.62506	.61643	.60798	.59971	.59161	.58368	.57592	.56831	.56086	.55356
14	.60637	.59752	.58887	.58042	.57215	.56406	.55615	.54842	.54085	.53344
15	.58847	.57945	.57063	.56202	.55362	.54540	.53738	.52954	.52188	.51439
16	.57134	.56216	.55321	.54448	.53596	.52765	.51953	.51162	.50389	.49635
17	.55494	.54563	.53657	.52773	.51913	.51074	.50257	.49460	.48683	.47925
18	.53922	.52981	.52066	.51175	.50308	.49464	.48642	.47842	.47063	.46303
19	.52416	.51467	.50545	.49649	.48777	.47930	.47106	.46304	.45524	.44765
20	.50972	.50018	.49091	.48191	.47317	.46468	.45643	.44841	.44062	.43304
21	.49586	.48629	.47699	.46797	.45922	.45073	.44249	.43449	.42672	.41917
22	.48260	.47298	.46367	.45465	.44590	.43742	.42920	.42123	.41349	.40599
23	.46986	.46023	.45092	.44190	.43317	.42472	.41653	.40860	.40091	.39345
24	.45762	.44800	.43870	.42970	.42100	.41259	.40444	.39656	.38892	.38153
25	.44586	.43627	.42699	.41803	.40937	.40100	.39290	.38508	.37750	.37018
26	.43460	.42501	.41577	.40685	.39823	.38992	.38188	.37412	.36662	.35936
27	.42375	.41421	.40501	.39613	.38758	.37932	.37135	.36366	.35623	.34906
28	.41333	.40383	.39468	.38587	.37737	.36919	.36129	.35367	.34632	.33923
29	.40332	.39386	.38477	.37602	.36760	.35948	.35166	.34413	.33686	.32985
30	.39366	.38429	.37526	.36658	.35823	.35019	.34246	.33500	.32782	.32090
31	.38441	.37508	.36612	.35752	.34924	.34129	.33364	.32627	.31918	.31236
32	.37546	.36623	.35734	.34882	.34063	.33276	.32520	.31792	.31092	.30419
33	.36689	.35771	.34891	.34046	.33236	.32458	.31710	.30992	.30302	.29637
34	.35862	.34951	.34079	.33243	.32442	.31673	.30935	.30226	.29545	.28890
35	.35064	.34162	.33299	.32472	.31679	.30920	.30191	.29492	.28820	.28175
36	.34296	.33402	.32548	.31730	.30947	.30196	.29477	.28787	.28125	.27490
37	.33555	.32670	.31825	.31016	.30242	.29502	.28792	.28112	.27459	.26833
38	.32841	.31965	.31129	.30329	.29565	.28834	.28134	.27463	.26820	.26204
39	.32151	.31285	.30458	.29668	.28913	.28192	.27501	.26840	.26207	.25600
40	.31486	.30629	.29812	.29031	.28286	.27574	.26893	.26242	.25618	.25021
41	.30844	.29996	.29188	.28418	.27682	.26980	.26309	.25667	.25052	.24464
42	.30224	.29386	.28587	.27826	.27101	.26408	.25746	.25114	.24508	.23929
43	.29624	.28796	.28008	.27256	.26540	.25857	.25205	.24581	.23985	.23415
44	.29046	.28227	.27448	.26706	.26000	.25326	.24683	.24069	.23482	.22921
45	.28486	.27677	.26908	.26176	.25478	.24814	.24180	.23576	.22998	.22446
46	.27945	.27145	.26386	.25663	.24976	.24321	.23696	.23100	.22531	.21988
47	.27421	.26631	.25881	.25168	.24490	.23844	.23229	.22642	.22082	.21547
48	.26915	.26135	.25394	.24690	.24021	.23385	.22778	.22200	.21649	.21122
49	.26424	.25654	.24923	.24229	.23569	.22941	.22343	.21774	.21231	.20712
50	.25950	.25189	.24467	.23782	.23131	.22512	.21923	.21362	.20827	.20317

DISCOUNTED TAX CREDIT
STRAIGHT LINE DEPRECIATION

DEPRECIATION PERIOD

	INTEREST RATE (% PER YEAR)									
YEARS	10.00	10.25	10.50	10.75	11.00	11.25	11.50	11.75	12.00	12.25
3	.82895	.82532	.82171	.81813	.81457	.81104	.80754	.80406	.80061	.79718
4	.79247	.78620	.78396	.77977	.77561	.77149	.76740	.76335	.75934	.75536
5	.75816	.75334	.74857	.74385	.73918	.73455	.72998	.72544	.72096	.71651
6	.72586	.72059	.71536	.71020	.70509	.70004	.69505	.69011	.68523	.68041
7	.69549	.68980	.68419	.67864	.67317	.66777	.66243	.65717	.65197	.64683
8	.66687	.66084	.65490	.64904	.64327	.63757	.63195	.62642	.62095	.61557
9	.63989	.63358	.62737	.62125	.61523	.60929	.60345	.59770	.59203	.58644
10	.61446	.60791	.60148	.59515	.58892	.58280	.57678	.57085	.56502	.55929
11	.59046	.58373	.57711	.57061	.56423	.55796	.55180	.54574	.53979	.53394
12	.56781	.56092	.55416	.54753	.54103	.53465	.52838	.52223	.51620	.51027
13	.54641	.53941	.53254	.52581	.51922	.51276	.50642	.50021	.49412	.48815
14	.52619	.51910	.51216	.50536	.49870	.49219	.48581	.47956	.47344	.46745
15	.50707	.49992	.49292	.48608	.47939	.47285	.46645	.46018	.45406	.44806
16	.48896	.48179	.47476	.46790	.46120	.45465	.44825	.44199	.43587	.42990
17	.47186	.46465	.45761	.45075	.44405	.43751	.43112	.42489	.41880	.41286
18	.45563	.44842	.44140	.43455	.42787	.42135	.41500	.40881	.40276	.39686
19	.44026	.43307	.42606	.41924	.41259	.40612	.39981	.39367	.38767	.38183
20	.42566	.41851	.41155	.40476	.39817	.39174	.38549	.37940	.37347	.36770
21	.41184	.40472	.39780	.39107	.38453	.37816	.37198	.36595	.36010	.35439
22	.39871	.39164	.38477	.37810	.37162	.36533	.35921	.35327	.34748	.34186
23	.38623	.37922	.37242	.36582	.35941	.35319	.34715	.34128	.33558	.33004
24	.37436	.36742	.36069	.35417	.34784	.34170	.33574	.32996	.32435	.31889
25	.36306	.35621	.34956	.34312	.33687	.33082	.32494	.31925	.31373	.30836
26	.35234	.34555	.33898	.33262	.32646	.32050	.31472	.30911	.30368	.29841
27	.34212	.33541	.32893	.32266	.31659	.31071	.30502	.29951	.29417	.28899
28	.33236	.32576	.31936	.31318	.30720	.30142	.29582	.29040	.28516	.28008
29	.32309	.31656	.31026	.30417	.29828	.29259	.28709	.28176	.27661	.27163
30	.31423	.30779	.30158	.29558	.28979	.28420	.27879	.27356	.26851	.26361
31	.30577	.29943	.29331	.28741	.28171	.27621	.27090	.26577	.26081	.25601
32	.29770	.29145	.28543	.27962	.27402	.26861	.26340	.25836	.25349	.24878
33	.28998	.28383	.27790	.27219	.26668	.26137	.25625	.25130	.24653	.24191
34	.28261	.27655	.27071	.26510	.25969	.25447	.24944	.24458	.23990	.23537
35	.27555	.26958	.26385	.25832	.25301	.24788	.24294	.23818	.23359	.22915
36	.26879	.26292	.25728	.25185	.24663	.24160	.23675	.23207	.22757	.22322
37	.26232	.25655	.25100	.24566	.24053	.23559	.23083	.22624	.22182	.21756
38	.25612	.25044	.24499	.23974	.23470	.22985	.22518	.22068	.21634	.21216
39	.25018	.24459	.23923	.23407	.22912	.22436	.21977	.21536	.21110	.20700
40	.24446	.23898	.23371	.22864	.22378	.21910	.21460	.21027	.20609	.20208
41	.23900	.23360	.22841	.22344	.21866	.21406	.20964	.20539	.20130	.19736
42	.23375	.22843	.22333	.21844	.21375	.20924	.20490	.20073	.19671	.19285
43	.22870	.22347	.21846	.21365	.20904	.20461	.20035	.19626	.19232	.18852
44	.22384	.21870	.21377	.20905	.20452	.20017	.19599	.19197	.18810	.18438
45	.21917	.21412	.20927	.20463	.20018	.19590	.19180	.18785	.18406	.18041
46	.21468	.20971	.20494	.20038	.19600	.19180	.18777	.18390	.18017	.17659
47	.21035	.20546	.20078	.19629	.19199	.18786	.18390	.18010	.17644	.17293
48	.20619	.20137	.19677	.19236	.18813	.18408	.18018	.17645	.17286	.16940
49	.20217	.19743	.19291	.18857	.18441	.18043	.17661	.17294	.16941	.16602
50	.19830	.19364	.18918	.18492	.18083	.17692	.17316	.16955	.16609	.16276

DISCOUNTED TAX CREDIT
DOUBLE DECLINING DEPRECIATION

INTEREST RATE
(% PER YEAR)

DEPRECIATION PERIOD

YEARS :	.00	.25	.50	.75	1.00	1.25	1.50	1.75	2.00	2.25
3	.96290	.95964	.95634	.95306	.94981	.94657	.94336	.94016	.93699	.93384
4	.93750	.93345	.92944	.92546	.92151	.91759	.91370	.90985	.90602	.90222
5	.92224	.91747	.91275	.90807	.90343	.89883	.89428	.88977	.88531	.88088
6	.91221	.90671	.90128	.89590	.89058	.88531	.88011	.87495	.86985	.86481
7	.905[illegible]4	.89891	.89277	.88669	.88069	.87477	.86891	.86312	.85740	.85174
8	.89989	.89294	.88608	.87932	.87264	.86606	.85956	.85314	.84681	.84056
9	.89584	.88816	.88060	.87315	.86580	.85656	.85143	.84440	.83747	.83064
10	.89263	.88422	.87595	.86781	.85981	.85192	.84417	.83653	.82901	.82161
11	.89001	.88088	.87191	.86309	.85442	.84590	.83753	.82930	.82121	.81325
12	.88784	.87798	.86831	.85882	.84950	.84035	.83137	.82255	.81390	.80540
13	.88602	.87543	.86506	.85489	.84493	.83516	.82558	.81619	.80698	.79795
14	.88446	.87315	.86208	.85124	.84064	.83025	.82009	.81013	.80038	.79083
15	.88311	.87107	.85931	.84781	.83657	.82558	.81484	.80432	.79404	.78398
16	.88193	.86917	.85672	.84456	.83269	.82110	.80979	.79873	.78793	.77737
17	.88090	.86742	.85427	.84146	.82897	.81679	.80491	.79331	.78200	.77096
18	.87996	.86577	.85195	.83849	.82538	.81261	.80017	.78805	.77624	.76473
19	.87916	.86423	.84972	.83562	.82190	.80855	.79557	.78293	.77063	.75866
20	.87842	.86278	.84759	.83284	.81851	.80459	.79107	.77793	.76515	.75273
21	.87776	.86139	.84552	.83014	.81521	.80073	.78668	.77304	.75979	.74693
22	.87715	.86007	.84353	.82751	.81199	.79695	.78237	.76824	.75454	.74125
23	.87660	.85880	.84159	.82494	.80883	.79324	.77815	.76354	.74939	.73568
24	.87610	.85758	.83970	.82242	.80573	.78960	.77400	.75892	.74433	.73021
25	.87564	.85640	.83785	.81996	.80269	.78602	.76993	.75438	.73936	.72484
26	.87521	.85526	.83604	.81753	.79969	.78250	.76591	.74991	.73447	.71956
27	.87481	.85415	.83427	.81515	.79675	.77903	.76196	.74551	.72965	.71436
28	.87445	.85307	.83253	.81280	.79384	.77560	.75806	.74117	.72491	.70925
29	.87411	.85201	.83082	.81049	.79097	.77222	.75421	.73689	.72024	.70422
30	.87379	.85098	.82914	.80821	.78814	.76889	.75041	.73267	.71563	.69926
31	.87349	.84998	.82748	.80596	.78534	.76559	.74666	.72851	.71109	.69437
32	.87321	.84899	.82585	.80373	.78257	.76233	.74296	.72439	.70661	.68955
33	.87295	.84802	.82423	.80153	.77984	.75911	.73929	.72033	.70218	.68480
34	.87270	.84706	.82264	.79935	.77713	.75592	.73567	.71632	.69782	.68012
35	.87247	.84613	.82106	.79719	.77445	.75277	.73209	.71235	.69351	.67549
36	.87225	.84520	.81949	.79505	.77179	.74965	.72855	.70843	.68925	.67093
37	.87205	.84429	.81795	.79293	.76916	.74655	.72504	.70456	.68504	.66643
38	.87185	.84339	.81642	.79083	.76655	.74349	.72157	.70072	.68088	.66198
39	.87166	.84250	.81490	.78875	.76397	.74046	.71814	.69693	.67677	.65759
40	.87149	.84162	.81339	.78669	.76140	.73745	.71474	.69318	.67271	.65326
41	.87132	.84075	.81190	.78464	.75886	.73447	.71137	.68947	.66870	.64898
42	.87116	.83989	.81042	.78260	.75634	.73151	.70803	.68580	.66473	.64475
43	.87101	.83904	.80895	.78058	.75384	.72858	.70472	.68216	.66080	.64057
44	.87086	.83820	.80748	.77858	.75135	.72568	.70145	.67856	.65692	.63645
45	.87072	.83736	.80603	.77659	.74889	.72280	.69820	.67500	.65308	.63237
46	.87059	.83653	.80459	.77461	.74644	.71994	.69499	.67147	.64929	.62834
47	.87046	.83571	.80316	.77255	.74401	.71710	.69180	.66798	.64553	.62435
48	.87034	.83489	.80174	.77069	.74160	.71429	.68864	.66452	.64181	.62041
49	.87023	.83408	.80032	.76875	.73920	.71150	.68551	.66109	.63813	.61652
50	.87011	.83328	.79892	.76683	.73682	.70873	.68240	.65770	.63450	.61267

DISCOUNTED TAX CREDIT
DOUBLE DECLINING DEPRECIATION

INTEREST RATE
(% PER YEAR)

DEPRECIATION PERIOD

YEARS	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75
3	.93071	.92759	.92450	.92143	.91838	.91535	.91233	.90934	.90636	.90341
4	.89846	.89472	.89101	.88733	.88368	.88005	.87646	.87289	.86935	.86583
5	.87649	.87214	.86784	.86357	.85934	.85514	.85099	.84687	.84279	.83874
6	.85981	.85487	.84998	.84514	.84035	.83560	.83091	.82626	.81166	.81711
7	.84616	.84063	.83517	.82978	.82444	.81917	.81396	.80880	.80371	.79867
8	.83439	.82830	.82229	.81636	.81050	.80472	.79901	.79337	.78780	.78230
9	.82391	.81727	.81072	.80427	.79790	.79163	.78544	.77934	.77331	.76738
10	.81435	.80715	.80009	.79313	.78628	.77953	.77288	.76634	.75988	.75353
11	.80545	.79773	.79016	.78272	.77540	.76820	.76111	.75414	.74727	.74052
12	.79705	.78885	.78079	.77288	.76510	.75747	.74996	.74258	.73533	.72820
13	.78909	.78040	.77187	.76350	.75529	.74723	.73932	.73156	.72393	.71645
14	.78147	.77230	.76332	.75451	.74588	.73742	.72912	.72099	.71301	.70519
15	.77414	.76451	.75508	.74585	.73681	.72797	.71930	.71082	.70250	.69436
16	.76706	.75697	.74712	.73748	.72805	.71884	.70982	.70100	.69237	.68392
17	.76019	.74967	.73940	.72936	.71957	.70999	.70064	.69150	.68256	.67383
18	.75351	.74256	.73189	.72148	.71132	.70141	.69173	.68229	.67306	.66406
19	.74700	.73564	.72458	.71380	.70330	.69306	.68308	.67334	.66385	.65458
20	.74064	.72889	.71745	.70632	.69548	.68493	.67465	.66464	.65489	.64538
21	.73443	.72229	.71049	.69901	.68786	.67700	.66645	.65618	.64618	.63644
22	.72635	.71583	.70367	.69187	.68041	.66927	.65845	.64793	.63770	.62775
23	.72239	.70950	.69701	.68489	.67313	.66172	.65064	.63988	.62943	.61928
24	.71654	.70330	.69048	.67805	.66601	.65434	.64302	.63203	.62138	.61103
25	.71080	.69721	.68407	.67136	.65904	.64712	.63557	.62437	.61352	.60299
26	.70515	.69124	.67779	.66479	.65222	.64006	.62828	.61688	.60585	.59515
27	.69961	.68537	.67163	.65836	.64553	.63314	.62116	.60957	.59836	.58750
28	.69416	.67961	.66558	.65204	.63898	.62637	.61419	.60242	.59104	.58004
29	.68879	.67394	.65964	.64585	.63255	.61973	.60736	.59542	.58389	.57275
30	.68351	.66837	.65379	.63976	.62625	.61323	.60068	.58857	.57690	.56562
31	.67831	.66288	.64805	.63379	.62007	.60686	.59413	.58187	.57006	.55867
32	.67319	.65749	.64241	.62792	.61399	.60060	.58772	.57532	.56337	.55186
33	.66814	.65217	.63686	.62215	.60803	.59447	.58143	.56889	.55683	.54522
34	.66317	.64694	.63139	.61648	.60218	.58845	.57527	.56260	.55042	.53871
35	.65827	.64179	.62602	.61091	.59643	.58255	.56922	.55644	.54415	.53235
36	.65344	.63672	.62073	.60543	.59078	.57675	.56330	.55040	.53802	.52613
37	.64867	.63172	.61552	.60004	.58523	.57106	.55748	.54448	.53200	.52004
38	.64397	.62679	.61040	.59474	.57978	.56547	.55178	.53867	.52611	.51408
39	.63933	.62194	.60535	.58952	.57441	.55998	.54618	.53298	.52034	.50824
40	.63476	.61715	.60038	.58439	.56914	.55459	.54068	.52740	.51469	.50252
41	.63024	.61243	.59548	.57934	.56396	.54929	.53529	.52192	.50914	.49692
42	.62579	.60778	.59066	.57437	.55886	.54408	.52999	.51655	.50371	.49144
43	.62139	.60319	.58590	.56947	.55385	.53897	.52479	.51128	.49838	.48607
44	.61705	.59866	.58122	.56466	.54891	.53394	.51968	.50610	.49316	.48080
45	.61277	.59420	.57661	.55991	.54406	.52900	.51467	.50103	.48803	.47564
46	.60853	.58980	.57206	.55524	.53929	.52414	.50974	.49604	.48300	.47058
47	.60436	.58546	.56757	.55064	.53459	.51936	.50490	.49115	.47807	.46562
48	.60023	.58117	.56315	.54611	.52996	.51466	.50014	.48634	.47323	.46076
49	.59615	.57694	.55880	.54164	.52541	.51004	.49546	.48162	.46848	.45599
50	.59213	.57277	.55450	.53724	.52093	.50549	.49086	.47699	.46382	.45131

DISCOUNTED TAX CREDIT
DOUBLE DECLINING DEPRECIATION

INTEREST RATE
(% PER YEAR)

DEPRECIATION PERIOD YEARS	5.00	5.25	5.50	5.75	6.00	6.25	6.50	6.75	7.00	7.25
3	.90047	.89755	.89465	.89177	.88890	.88605	.88322	.88041	.87762	.87484
4	.86235	.85888	.85545	.85204	.84866	.84530	.84196	.83865	.83537	.83211
5	.83475	.83076	.82682	.82291	.81904	.81520	.81139	.80762	.80388	.80017
6	.81260	.80614	.80372	.79934	.79501	.79072	.78647	.78227	.77810	.77397
7	.79369	.78876	.78389	.77907	.77431	.76959	.76493	.76032	.75576	.75125
8	.77687	.77150	.76620	.76097	.75580	.75069	.74564	.74066	.73573	.73086
9	.76152	.75574	.75003	.74441	.73886	.73338	.72797	.72264	.71737	.71217
10	.74727	.74109	.73501	.72902	.72311	.71729	.71155	.70589	.70031	.69481
11	.73388	.72733	.72090	.71456	.70832	.70217	.69612	.69016	.68429	.67851
12	.72119	.71430	.70752	.70086	.69431	.68787	.68153	.67529	.66916	.66312
13	.70910	.70188	.69479	.68782	.68098	.67426	.66765	.66116	.65478	.64851
14	.69751	.68998	.68260	.67535	.66824	.66125	.65440	.64767	.64107	.63458
15	.68638	.67856	.67090	.66338	.65602	.64880	.64171	.63477	.62796	.62127
16	.67565	.66756	.65963	.65187	.64427	.63683	.62954	.62239	.61539	.60853
17	.66529	.65694	.64877	.64078	.63296	.62531	.61782	.61049	.60332	.59630
18	.65526	.64667	.63827	.63007	.62205	.61421	.60654	.59904	.59171	.58454
19	.64555	.63673	.62812	.61971	.61150	.60349	.59566	.58801	.58053	.57323
20	.63612	.62709	.61828	.60969	.60131	.59313	.58515	.57736	.56975	.56233
21	.62697	.61773	.60874	.59998	.59144	.58311	.57499	.56708	.55935	.55182
22	.61807	.60865	.59948	.59056	.58187	.57341	.56517	.55714	.54931	.54167
23	.60941	.59982	.59050	.58142	.57260	.56401	.55566	.54752	.53960	.53189
24	.60099	.59124	.58176	.57255	.56360	.55490	.54644	.53821	.53020	.52241
25	.59276	.58288	.57327	.56393	.55487	.54607	.53751	.52920	.52111	.51325
26	.58479	.57474	.56500	.55556	.54639	.53749	.52885	.52046	.51231	.50439
27	.57700	.56682	.55696	.54741	.53814	.52916	.52045	.51199	.50378	.49581
28	.56940	.55910	.54913	.53948	.53013	.52107	.51229	.50377	.49551	.48750
29	.56196	.55157	.54150	.53176	.52233	.51321	.50437	.49580	.48750	.47945
30	.55474	.54423	.53407	.52425	.51475	.50556	.49667	.48806	.47972	.47164
31	.54767	.53707	.52682	.51693	.50737	.49812	.48919	.48054	.47217	.46406
32	.54077	.53008	.51976	.50980	.50018	.49089	.48191	.47323	.46484	.45671
33	.53403	.52325	.51287	.50285	.49318	.48385	.47484	.46613	.45771	.44958
34	.52744	.51659	.50614	.49607	.48636	.47699	.46795	.45923	.45080	.44265
35	.52100	.51009	.49958	.48946	.47971	.47031	.46125	.45251	.44407	.43592
36	.51471	.50373	.49317	.48301	.47323	.46381	.45473	.44598	.43753	.42938
37	.50855	.49752	.48692	.47672	.46691	.45747	.44838	.43962	.43117	.42302
38	.50253	.49145	.48080	.47058	.46075	.45129	.44219	.43342	.42498	.41684
39	.49664	.48551	.47484	.46458	.45473	.44527	.43616	.42740	.41896	.41082
40	.49087	.47971	.46900	.45873	.44887	.43939	.43028	.42152	.41309	.40497
41	.48523	.47403	.46330	.45301	.44314	.43366	.42455	.41580	.40738	.39928
42	.47971	.46848	.45773	.44742	.43755	.42807	.41896	.41022	.40182	.39373
43	.47430	.46305	.45228	.44197	.43208	.42261	.41351	.40478	.39639	.38833
44	.46900	.45773	.44695	.43663	.42675	.41728	.40820	.39948	.39111	.38307
45	.46382	.45253	.44173	.43141	.42154	.41207	.40301	.39431	.38596	.37794
46	.45874	.44743	.43663	.42631	.41644	.40699	.39794	.38926	.38094	.37294
47	.45376	.44244	.43164	.42133	.41146	.40203	.39299	.38434	.37604	.36807
48	.44888	.43756	.42676	.41645	.40659	.39717	.38816	.37953	.37125	.36332
49	.44410	.43277	.42197	.41167	.40183	.39243	.38344	.37483	.36659	.35868
50	.43941	.42808	.41729	.40700	.39718	.38780	.37883	.37025	.36203	.35416

DISCOUNTED TAX CREDIT
DOUBLE DECLINING DEPRECIATION

DEPRECIATION PERIOD	INTEREST RATE (% PER YEAR)									
YEARS	7.50	7.75	8.00	8.25	8.50	8.75	9.00	9.25	9.50	9.75
3	.87206	.86933	.86661	.86390	.86120	.85852	.85586	.85321	.85058	.84797
4	.82887	.82566	.82247	.81930	.81616	.81303	.80994	.80686	.80380	.80077
5	.79649	.79285	.78923	.78565	.78209	.77857	.77507	.77160	.76817	.76476
6	.76989	.76584	.76184	.75787	.75394	.75004	.74618	.74236	.73858	.73483
7	.74679	.74237	.73801	.73368	.72941	.72518	.72099	.71685	.71275	.70870
8	.72605	.72130	.71660	.71196	.70737	.70283	.69835	.69392	.68954	.68521
9	.70704	.70198	.69698	.69205	.68717	.68236	.67761	.67292	.66829	.66371
10	.68936	.68404	.67876	.67356	.66843	.66337	.65838	.65345	.64859	.64380
11	.67282	.66721	.66169	.65624	.65088	.64559	.64039	.63525	.63019	.62521
12	.65716	.65133	.64558	.63992	.63435	.62886	.62346	.61814	.61290	.60774
13	.64234	.63628	.63032	.62446	.61870	.61303	.60746	.60197	.59658	.59127
14	.62821	.62195	.61581	.60977	.60384	.59801	.59228	.58666	.58112	.57568
15	.61472	.60628	.60197	.59577	.58969	.58372	.57786	.57210	.56645	.56089
16	.60180	.59521	.58874	.58240	.57619	.57009	.56411	.55824	.55248	.54683
17	.58942	.58268	.57608	.56961	.56328	.55707	.55098	.54501	.53916	.53343
18	.57752	.57065	.56393	.55735	.55091	.54461	.53843	.53238	.52645	.52064
19	.56606	.55910	.55227	.54559	.53906	.53267	.52641	.52029	.51430	.50843
20	.55507	.54799	.54106	.53430	.52769	.52122	.51490	.50872	.50267	.49675
21	.54446	.53729	.53028	.52344	.51676	.51023	.50385	.49762	.49153	.48557
22	.53425	.52678	.51990	.51279	.50625	.49967	.49324	.48697	.48084	.47485
23	.52436	.51703	.50989	.50292	.49613	.48951	.48305	.47674	.47058	.46457
24	.51482	.50743	.50024	.49322	.48639	.47973	.47324	.46691	.46073	.45471
25	.50560	.49816	.49092	.48387	.47700	.47032	.46380	.45745	.45126	.44523
26	.49669	.48921	.48193	.47484	.46795	.46124	.45471	.44835	.44215	.43612
27	.48807	.48055	.47323	.46613	.45922	.45249	.44595	.43958	.43338	.42735
28	.47972	.47217	.46483	.45771	.45078	.44405	.43750	.43114	.42494	.41891
29	.47164	.46406	.45671	.44957	.44263	.43590	.42935	.42299	.41680	.41078
30	.46380	.45621	.44884	.44170	.43476	.42803	.42148	.41513	.40895	.40295
31	.45621	.44861	.44123	.43408	.42715	.42042	.41388	.40754	.40138	.39539
32	.44885	.44123	.43386	.42671	.41978	.41306	.40654	.40021	.39407	.38810
33	.44171	.43409	.42671	.41957	.41265	.40594	.39944	.39313	.38701	.38106
34	.43477	.42716	.41979	.41266	.40575	.39906	.39257	.38628	.38018	.37427
35	.42804	.42043	.41307	.40595	.39906	.39239	.38592	.37966	.37359	.36770
36	.42151	.41391	.40656	.39945	.39258	.38593	.37949	.37325	.36721	.36135
37	.41516	.40757	.40023	.39315	.38630	.37967	.37325	.36705	.36103	.35521
38	.40899	.40141	.39410	.38703	.38020	.37360	.36721	.36104	.35505	.34926
39	.40299	.39543	.38813	.38109	.37429	.36772	.36136	.35521	.34926	.34350
40	.39715	.38961	.38234	.37532	.36855	.36201	.35568	.34957	.34365	.33793
41	.39147	.38396	.37671	.36972	.36298	.35646	.35017	.34409	.33821	.33253
42	.38595	.37846	.37124	.36428	.35756	.35108	.34483	.33878	.33294	.32729
43	.38057	.37311	.36591	.35898	.35230	.34586	.33964	.33363	.32782	.32221
44	.37534	.36790	.36074	.35384	.34719	.34078	.33459	.32862	.32285	.31728
45	.37024	.36283	.35570	.34883	.34222	.33584	.32969	.32376	.31803	.31250
46	.36527	.35789	.35079	.34396	.33738	.33104	.32493	.31904	.31335	.30785
47	.36042	.35308	.34601	.33922	.33268	.32638	.32030	.31445	.30880	.30334
48	.35570	.34839	.34136	.33460	.32810	.32183	.31580	.30998	.30437	.29895
49	.35110	.34382	.33683	.33011	.32364	.31741	.31142	.30564	.30007	.29469
50	.34661	.33937	.33241	.32573	.31930	.31311	.30715	.30142	.29588	.29055

DISCOUNTED TAX CREDIT
DOUBLE DECLINING DEPRECIATION

DEPRECIATION PERIOD

YEARS	10.00	10.25	10.50	10.75	11.00	11.25	11.50	11.75	12.00	12.25
	INTEREST RATE (% PER YEAR)									
3	.84537	.84278	.84022	.83766	.83512	.83260	.83009	.82760	.82512	.82265
4	.79776	.79477	.79180	.78885	.78593	.78302	.78013	.77727	.77442	.77159
5	.76137	.75802	.75469	.75139	.74812	.74487	.74165	.73846	.73529	.73215
6	.73111	.72743	.72378	.72017	.71659	.71304	.70953	.70604	.70259	.69917
7	.70466	.70071	.69678	.69288	.68903	.68522	.68144	.67771	.67401	.67034
8	.68095	.67669	.67251	.66837	.66428	.66023	.65623	.65227	.64836	.64448
9	.65919	.65473	.65032	.64596	.64166	.63741	.63321	.62906	.62496	.62091
10	.63907	.63440	.62980	.62525	.62076	.61634	.61197	.60765	.60339	.59919
11	.62029	.61544	.61067	.60596	.60131	.59673	.59221	.58776	.58336	.57903
12	.60266	.59766	.59273	.58788	.58310	.57839	.57374	.56917	.56466	.56021
13	.58605	.58091	.57585	.57088	.56598	.56115	.55640	.55173	.54712	.54259
14	.57034	.56508	.55991	.55483	.54983	.54491	.54007	.53531	.53063	.52602
15	.55544	.55008	.54482	.53964	.53456	.52956	.52465	.51982	.51508	.51041
16	.54126	.53584	.53049	.52524	.52009	.51503	.51006	.50518	.50038	.49566
17	.52780	.52229	.51687	.51156	.50635	.50124	.49622	.49130	.48646	.48171
18	.51495	.50938	.50391	.49855	.49330	.48814	.48309	.47813	.47327	.46849
19	.50269	.49706	.49155	.48615	.48086	.47568	.47060	.46562	.46073	.45595
20	.49096	.48530	.47975	.47433	.46901	.46380	.45871	.45371	.44882	.44402
21	.47975	.47405	.46848	.46303	.45770	.45248	.44737	.44237	.43747	.43267
22	.46900	.46329	.45770	.45224	.44689	.44167	.43656	.43155	.42666	.42187
23	.45871	.45298	.44738	.44191	.43656	.43133	.42623	.42123	.41634	.41156
24	.44883	.44309	.43749	.43201	.42667	.42145	.41635	.41136	.40649	.40173
25	.43934	.43360	.42800	.42253	.41720	.41199	.40690	.40193	.39707	.39233
26	.43023	.42449	.41890	.41344	.40812	.40292	.39785	.39290	.38806	.38334
27	.42147	.41574	.41016	.40471	.39940	.39423	.38918	.38425	.37944	.37474
28	.41304	.40732	.40175	.39633	.39104	.38589	.38086	.37596	.37117	.36651
29	.40492	.39922	.39367	.38827	.38300	.37787	.37287	.36800	.36325	.35861
30	.39711	.39143	.38590	.38052	.37528	.37018	.36520	.36036	.35564	.35103
31	.38957	.38391	.37841	.37306	.36785	.36277	.35783	.35302	.34833	.34376
32	.38231	.37667	.37120	.36587	.36069	.35565	.35074	.34596	.34131	.33678
33	.37529	.36969	.36424	.35895	.35380	.34879	.34392	.33918	.33456	.33006
34	.36852	.36295	.35753	.35227	.34716	.34218	.33735	.33264	.32806	.32360
35	.36199	.35644	.35106	.34583	.34075	.33581	.33101	.32634	.32180	.31738
36	.35567	.35016	.34481	.33961	.33457	.32967	.32491	.32028	.31577	.31139
37	.34956	.34408	.33877	.33361	.32860	.32374	.31902	.31442	.30996	.30562
38	.34365	.33820	.33293	.32781	.32284	.31801	.31333	.30878	.30435	.30005
39	.33793	.33252	.32728	.32220	.31727	.31248	.30784	.30332	.29894	.29468
40	.33239	.32702	.32182	.31677	.31188	.30714	.30253	.29806	.29371	.28949
41	.32702	.32169	.31653	.31152	.30667	.30197	.29740	.29297	.28866	.28448
42	.32182	.31653	.31141	.30644	.30163	.29696	.29244	.28804	.28378	.27963
43	.31676	.31153	.30644	.30152	.29675	.29212	.28763	.28328	.27905	.27495
44	.31189	.30668	.30163	.29675	.29202	.28743	.28298	.27867	.27448	.27042
45	.30715	.30197	.29697	.29212	.28743	.28288	.27848	.27420	.27006	.26603
46	.30254	.29741	.29244	.28764	.28298	.27848	.27411	.26988	.26577	.26178
47	.29807	.29299	.28805	.28328	.27867	.27421	.26988	.26568	.26162	.25767
48	.29372	.28867	.28379	.27906	.27449	.27006	.26577	.26162	.25759	.25368
49	.28950	.28449	.27964	.27496	.27042	.26604	.26179	.25767	.25368	.24981
50	.28540	.28042	.27562	.27097	.26648	.26213	.25792	.25384	.24989	.24605

DISCOUNTED TAX CREDIT
SUM OF DIGITS DEPRECIATION

INTEREST RATE
(% PER YEAR)

DEPRECIATION PERIOD

YEARS	.00	.25	.50	.75	1.00	1.25	1.50	1.75	2.00	2.25
3	1.00000	.99656	.99197	.98774	.98367	.97961	.97559	.97159	.96765	.96374
4	1.00000	.99559	.99027	.98531	.98041	.97558	.97080	.96605	.96136	.95672
5	1.00000	.99460	.98860	.98285	.97718	.97159	.96605	.96056	.95514	.94978
6	1.00000	.99386	.98695	.98039	.97397	.96761	.96133	.95511	.94898	.94291
7	1.00000	.99295	.98531	.97797	.97078	.96367	.95665	.94972	.94288	.93612
8	1.00000	.99206	.98367	.97557	.96760	.95975	.95201	.94436	.93684	.92941
9	1.00000	.99122	.98204	.97316	.96444	.95585	.94740	.93906	.93085	.92276
10	1.00000	.99030	.98040	.97076	.96130	.95198	.94282	.93380	.92493	.91619
11	1.00000	.98948	.97878	.96838	.95817	.94814	.93828	.92858	.91906	.90969
12	1.00000	.98871	.97717	.96599	.95506	.94431	.93377	.92341	.91325	.90326
13	1.00000	.98788	.97556	.96363	.95196	.94051	.92929	.91828	.90749	.89690
14	1.00000	.98703	.97396	.96127	.94888	.93674	.92485	.91320	.90179	.89061
15	1.00000	.98620	.97236	.95892	.94581	.93298	.92044	.90815	.89614	.88438
16	1.00000	.98536	.97076	.95659	.94276	.92925	.91606	.90315	.89055	.87823
17	1.00000	.98453	.96916	.95426	.93972	.92554	.91171	.89820	.88501	.87213
18	1.00000	.98372	.96758	.95193	.93670	.92186	.90739	.89328	.87952	.86611
19	1.00000	.98290	.96599	.94962	.93369	.91820	.90311	.88841	.87409	.86014
20	1.00000	.98204	.96440	.94731	.93070	.91456	.89885	.88357	.86871	.85424
21	1.00000	.98123	.96283	.94502	.92773	.91094	.89463	.87878	.86338	.84840
22	1.00000	.98042	.96126	.94273	.92476	.90734	.89043	.87402	.85809	.84263
23	1.00000	.97961	.95969	.94045	.92182	.90377	.88627	.86931	.85286	.83691
24	1.00000	.97884	.95813	.93817	.91888	.90021	.88214	.86463	.84768	.83125
25	1.00000	.97802	.95656	.93591	.91596	.89668	.87803	.86000	.84255	.82566
26	1.00000	.97721	.95501	.93366	.91306	.89317	.87396	.85540	.83746	.82012
27	1.00000	.97641	.95346	.93141	.91017	.88968	.86991	.85084	.83242	.81464
28	1.00000	.97559	.95191	.92917	.90729	.88621	.86590	.84631	.82743	.80922
29	1.00000	.97478	.95037	.92694	.90443	.88276	.86191	.84183	.82249	.80385
30	1.00000	.97398	.94883	.92472	.90158	.87933	.85795	.83738	.81759	.79854
31	1.00000	.97318	.94729	.92251	.89874	.87593	.85402	.83296	.81273	.79328
32	1.00000	.97237	.94575	.92031	.89592	.87254	.85011	.82859	.80792	.78808
33	1.00000	.97157	.94422	.91811	.89311	.86917	.84624	.82425	.80316	.78293
34	1.00000	.97077	.94270	.91592	.89032	.86583	.84239	.81994	.79844	.77783
35	1.00000	.96997	.94118	.91374	.88753	.86250	.83856	.81567	.79376	.77278
36	1.00000	.96918	.93966	.91156	.88477	.85919	.83477	.81143	.78913	.76779
37	1.00000	.96838	.93815	.90940	.88201	.85590	.83100	.80723	.78453	.76285
38	1.00000	.96758	.93664	.90724	.87927	.85264	.82726	.80306	.77998	.75796
39	1.00000	.96679	.93513	.90509	.87654	.84939	.82354	.79893	.77548	.75311
40	1.00000	.96598	.93362	.90295	.87383	.84616	.81985	.79483	.77101	.74832
41	1.00000	.96519	.93212	.90081	.87112	.84295	.81619	.79076	.76658	.74357
42	1.00000	.96440	.93063	.89869	.86843	.83975	.81255	.78672	.76219	.73888
43	1.00000	.96361	.92914	.89657	.86576	.83658	.80890	.78272	.75785	.73422
44	1.00000	.96282	.92765	.89446	.86309	.83343	.80535	.77875	.75354	.72962
45	1.00000	.96203	.92616	.89235	.86044	.83029	.80178	.77481	.74927	.72506
46	1.00000	.96125	.92468	.89026	.85780	.82717	.79824	.77090	.74504	.72055
47	1.00000	.96046	.92320	.88817	.85517	.82407	.79473	.76702	.74084	.71608
48	1.00000	.95970	.92173	.88609	.85256	.82099	.79124	.76318	.73669	.71166
49	1.00000	.95891	.92026	.88401	.84996	.81793	.78777	.75936	.73257	.70728
50	1.00000	.95813	.91879	.88195	.84737	.81488	.78433	.75558	.72849	.70294

DISCOUNTED TAX CREDIT
SUM OF DIGITS DEPRECIATION

INTEREST RATE
(% PER YEAR)

DEPRECIATION PERIOD

YEARS	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75
3	.95985	.95600	.95217	.94836	.94459	.94084	.93712	.93343	.92976	.92612
4	.95211	.94754	.94301	.93852	.93406	.92965	.92526	.92092	.91661	.91234
5	.94446	.93920	.93399	.92882	.92371	.91865	.91363	.90866	.90374	.89886
6	.93691	.93097	.92510	.91928	.91354	.90785	.90222	.89665	.89114	.88569
7	.92945	.92285	.91633	.90989	.90353	.89724	.89102	.88488	.87881	.87281
8	.92207	.91484	.90770	.90064	.89369	.88682	.88004	.87335	.86674	.86021
9	.91479	.90693	.89918	.89154	.88401	.87658	.86926	.86204	.85492	.84790
10	.90759	.89913	.89079	.88258	.87449	.86653	.85868	.85096	.84335	.83585
11	.90048	.89142	.88252	.87375	.86513	.85665	.84830	.84009	.83202	.82406
12	.89346	.88382	.87436	.86506	.85592	.84694	.83812	.82944	.82092	.81254
13	.88651	.87632	.86632	.85650	.84686	.83741	.82812	.81900	.81005	.80126
14	.87965	.86892	.85839	.84807	.83795	.82803	.81830	.80876	.79940	.79022
15	.87288	.86161	.85058	.83977	.82919	.81882	.80867	.79872	.78897	.77942
16	.86618	.85439	.84287	.83159	.82056	.80977	.79921	.78887	.77876	.76885
17	.85956	.84727	.83527	.82354	.81208	.80088	.78992	.77922	.76875	.75850
18	.85302	.84024	.82778	.81561	.80373	.79213	.78080	.76974	.75894	.74838
19	.84655	.83330	.82039	.80779	.79551	.78354	.77185	.76045	.74932	.73846
20	.84016	.82645	.81310	.80010	.78743	.77509	.76306	.75133	.73990	.72876
21	.83385	.81969	.80591	.79251	.77947	.76678	.75442	.74239	.73067	.71925
22	.82760	.81301	.79883	.78504	.77164	.75861	.74594	.73361	.72161	.70994
23	.82143	.80641	.79184	.77768	.76393	.75058	.73761	.72500	.71274	.70082
24	.81534	.79990	.78494	.77043	.75635	.74268	.72942	.71654	.70404	.69189
25	.80931	.79348	.77814	.76328	.74888	.73492	.72138	.70825	.69551	.68314
26	.80335	.78713	.77143	.75624	.74153	.72728	.71348	.70010	.68714	.67457
27	.79746	.78086	.76481	.74930	.73429	.71977	.70572	.69211	.67894	.66617
28	.79164	.77467	.75828	.74246	.72716	.71238	.69809	.68426	.67089	.65794
29	.78586	.76856	.75184	.73572	.72015	.70511	.69059	.67656	.66299	.64988
30	.78019	.76252	.74549	.72907	.71324	.69796	.68322	.66899	.65525	.64197
31	.77456	.75656	.73922	.72252	.70644	.69093	.67598	.66156	.64765	.63422
32	.76900	.75067	.73303	.71607	.69974	.68401	.66887	.65427	.64020	.62663
33	.76350	.74485	.72693	.70970	.69314	.67721	.66187	.64710	.63288	.61918
34	.75807	.73910	.72091	.70343	.68664	.67051	.65499	.64007	.62570	.61188
35	.75269	.73343	.71496	.69725	.68024	.66391	.64823	.63315	.61866	.60472
36	.74737	.72782	.70910	.69115	.67394	.65743	.64158	.62636	.61174	.59769
37	.74212	.72229	.70331	.68514	.66773	.65104	.63504	.61969	.60496	.59080
38	.73692	.71682	.69760	.67921	.66161	.64476	.62861	.61314	.59829	.58404
39	.73176	.71141	.69196	.67336	.65559	.63858	.62229	.60670	.59175	.57742
40	.72669	.70607	.68639	.66760	.64965	.63249	.61607	.60037	.58532	.57091
41	.72167	.70080	.68090	.66192	.64380	.62650	.60996	.59414	.57901	.56453
42	.71670	.69558	.67548	.65631	.63804	.62060	.60394	.58803	.57282	.55827
43	.71176	.69043	.67012	.65078	.63236	.61479	.59802	.58202	.56673	.55212
44	.70692	.68535	.66484	.64533	.62676	.60907	.59220	.57611	.56075	.54609
45	.70211	.68032	.65962	.63995	.62124	.60344	.58647	.57030	.55488	.54016
46	.69735	.67535	.65447	.63465	.61581	.59789	.58084	.56459	.54911	.53435
47	.69264	.67044	.64939	.62942	.61045	.59243	.57529	.55898	.54345	.52864
48	.68799	.66559	.64437	.62425	.60517	.58705	.56983	.55346	.53788	.52304
49	.68336	.66079	.63941	.61916	.59996	.58175	.56446	.54803	.53240	.51753
50	.67883	.65605	.63452	.61414	.59483	.57653	.55917	.54269	.52702	.51213

DISCOUNTED TAX CREDIT
SUM OF DIGITS DEPRECIATION

INTEREST RATE
(% PER YEAR)

DEPRECIATION PERIOD

YEARS	5.00	5.25	5.50	5.75	6.00	6.25	6.50	6.75	7.00	7.25
3	.92251	.91892	.91535	.91182	.90830	.90481	.90135	.89790	.89449	.89109
4	.90810	.90390	.89973	.89559	.89149	.88742	.88339	.87938	.87541	.87147
5	.89403	.88925	.88450	.87981	.87515	.87054	.86597	.86144	.85696	.85251
6	.88029	.87496	.86967	.86444	.85927	.85415	.84907	.84406	.83909	.83417
7	.86688	.86101	.85522	.84949	.84382	.83822	.83268	.82721	.82179	.81644
8	.85377	.84741	.84113	.83493	.82880	.82275	.81677	.81087	.80504	.79928
9	.84097	.83414	.82740	.82075	.81419	.80772	.80133	.79503	.78882	.78268
10	.82848	.82118	.81401	.80694	.79997	.79311	.78634	.77967	.77310	.76661
11	.81624	.80854	.80095	.79349	.78614	.77891	.77179	.76477	.75786	.75106
12	.80429	.79619	.78822	.78039	.77268	.76510	.75765	.75031	.74310	.73600
13	.79262	.78414	.77581	.76762	.75958	.75168	.74392	.73628	.72878	.72141
14	.78121	.77237	.76370	.75518	.74683	.73863	.73057	.72267	.71490	.70728
15	.77008	.76088	.75188	.74306	.73441	.72593	.71761	.70945	.70144	.69358
16	.75915	.74965	.74035	.73124	.72232	.71357	.70500	.69661	.68838	.68031
17	.74849	.73869	.72910	.71972	.71054	.70155	.69275	.68414	.67570	.66744
18	.73808	.72798	.71812	.70849	.69906	.68985	.68084	.67203	.66340	.65496
19	.72788	.71751	.70740	.69753	.68788	.67846	.66925	.66026	.65146	.64286
20	.71788	.70728	.69694	.68684	.67699	.66737	.65798	.64882	.63986	.63112
21	.70815	.69728	.68672	.67642	.66637	.65658	.64702	.63770	.62860	.61972
22	.69858	.68751	.67674	.66625	.65602	.64606	.63635	.62689	.61766	.60866
23	.68925	.67796	.66699	.65632	.64593	.63582	.62597	.61638	.60703	.59792
24	.68005	.66862	.65747	.64663	.63609	.62584	.61586	.60615	.59670	.58750
25	.67114	.65949	.64817	.63718	.62649	.61611	.60602	.59620	.58666	.57737
26	.66238	.65056	.63908	.62795	.61713	.60663	.59643	.58652	.57689	.56753
27	.65381	.64182	.63020	.61893	.60800	.59739	.58710	.57710	.56740	.55797
28	.64541	.63328	.62152	.61013	.59909	.58839	.57800	.56793	.55816	.54867
29	.63719	.62492	.61304	.60153	.59039	.57960	.56914	.55900	.54917	.53964
30	.62914	.61674	.60474	.59314	.58191	.57103	.56051	.55031	.54043	.53085
31	.62126	.60873	.59663	.58493	.57362	.56268	.55209	.54184	.53192	.52231
32	.61354	.60090	.58870	.57691	.56553	.55452	.54388	.53359	.52363	.51399
33	.60597	.59323	.58094	.56908	.55763	.54657	.53588	.52555	.51556	.50590
34	.59856	.58572	.57335	.56142	.54991	.53880	.52808	.51772	.50771	.49803
35	.59130	.57837	.56593	.55394	.54237	.53122	.52047	.51008	.50005	.49037
36	.58418	.57118	.55867	.54662	.53501	.52382	.51304	.50263	.49260	.48290
37	.57720	.56413	.55156	.53946	.52781	.51660	.50579	.49537	.48533	.47564
38	.57037	.55723	.54460	.53246	.52078	.50954	.49872	.48829	.47824	.46856
39	.56367	.55047	.53779	.52562	.51391	.50265	.49181	.48138	.47134	.46166
40	.55710	.54384	.53113	.51892	.50719	.49592	.48507	.47464	.46460	.45494
41	.55065	.53736	.52460	.51237	.50062	.48934	.47849	.46807	.45804	.44838
42	.54434	.53100	.51821	.50595	.49419	.48291	.47206	.46165	.45163	.44200
43	.53814	.52476	.51195	.49968	.48791	.47662	.46579	.45538	.44538	.43577
44	.53207	.51866	.50582	.49354	.48176	.47048	.45965	.44926	.43928	.42969
45	.52610	.51267	.49982	.48752	.47575	.46447	.45366	.44328	.43333	.42376
46	.52026	.50680	.49394	.48164	.46987	.45860	.44780	.43745	.42751	.41798
47	.51452	.50184	.48817	.47587	.46411	.45285	.44207	.43174	.42184	.41234
48	.50889	.49540	.48253	.47023	.45847	.44723	.43647	.42617	.41630	.40683
49	.50337	.48987	.47699	.46470	.45296	.44174	.43100	.42072	.41088	.40145
50	.49795	.48444	.47156	.45928	.44756	.43636	.42565	.41540	.40559	.39620

DISCOUNTED TAX CREDIT
SUM OF DIGITS DEPRECIATION

DEPRECIATION PERIOD

YEARS	INTEREST RATE (% PER YEAR) 7.50	7.75	8.00	8.25	8.50	8.75	9.00	9.25	9.50	9.75
3	.88772	.88437	.88105	.87775	.87447	.87121	.86797	.86476	.86157	.85840
4	.86757	.86369	.85984	.85603	.85224	.84848	.84476	.84106	.83739	.83375
5	.84810	.84374	.83941	.83512	.83087	.82666	.82248	.81834	.81424	.81017
6	.82930	.82449	.81971	.81499	.81032	.80569	.80110	.79656	.79207	.78762
7	.81114	.80591	.80073	.79561	.79054	.78553	.78057	.77567	.77082	.76603
8	.79359	.78797	.78242	.77693	.77151	.76615	.76086	.75563	.75046	.74535
9	.77663	.77065	.76475	.75893	.75319	.74751	.74191	.73639	.73093	.72554
10	.76022	.75392	.74771	.74158	.73554	.72958	.72371	.71791	.71219	.70655
11	.74436	.73776	.73126	.72485	.71854	.71232	.70620	.70016	.69421	.68835
12	.72901	.72214	.71537	.70871	.70213	.69571	.68936	.68310	.67694	.67088
13	.71416	.70704	.70003	.69314	.68637	.67970	.67315	.66670	.66036	.65412
14	.69979	.69244	.68521	.67811	.67114	.66428	.65755	.65093	.64443	.63803
15	.68586	.67831	.67089	.66360	.65645	.64942	.64253	.63576	.62911	.62258
16	.67240	.66465	.65704	.64959	.64227	.63510	.62806	.62115	.61438	.60773
17	.65935	.65142	.64366	.63605	.62859	.62128	.61412	.60709	.60020	.59345
18	.64671	.63862	.63071	.62296	.61538	.60795	.60067	.59355	.58656	.57972
19	.63445	.62623	.61818	.61032	.60262	.59509	.58771	.58050	.57343	.56651
20	.62257	.61422	.60606	.59809	.59029	.58267	.57521	.56792	.56078	.55380
21	.61105	.60259	.59433	.58626	.57837	.57067	.56314	.55579	.54860	.54156
22	.59906	.59132	.58297	.57491	.56685	.55908	.55150	.54409	.53685	.52977
23	.58905	.58040	.57196	.56374	.55571	.54789	.54025	.53280	.52552	.51841
24	.57853	.56981	.56130	.55301	.54494	.53706	.52938	.52190	.51459	.50746
25	.56833	.55953	.55097	.54263	.53451	.52660	.51889	.51137	.50405	.49690
26	.55842	.54957	.54096	.53257	.52441	.51647	.50874	.50120	.49387	.48672
27	.54880	.53990	.53124	.52283	.51464	.50668	.49892	.49138	.48404	.47688
28	.53946	.53052	.52183	.51338	.50517	.49719	.48943	.48188	.47454	.46739
29	.53039	.52141	.51269	.50422	.49600	.48801	.48025	.47270	.46536	.45822
30	.52157	.51256	.50382	.49534	.48711	.47912	.47136	.46382	.45649	.44936
31	.51299	.50397	.49522	.48673	.47850	.47051	.46275	.45522	.44790	.44080
32	.50466	.49562	.48686	.47837	.47014	.46216	.45441	.44690	.43960	.43252
33	.49656	.48751	.47875	.47026	.46204	.45407	.44634	.43884	.43157	.42451
34	.48867	.47962	.47086	.46238	.45417	.44622	.43851	.43104	.42379	.41676
35	.48101	.47196	.46320	.45474	.44654	.43861	.43092	.42347	.41626	.40926
36	.47354	.46450	.45576	.44731	.43913	.43122	.42356	.41614	.40896	.40200
37	.46626	.45725	.44852	.44009	.43194	.42405	.41642	.40904	.40189	.39496
38	.45921	.45019	.44148	.43307	.42495	.41709	.40949	.40215	.39503	.38815
39	.45232	.44332	.43464	.42625	.41816	.41033	.40277	.39546	.38838	.38154
40	.44562	.43664	.42798	.41962	.41156	.40377	.39624	.38897	.38194	.37513
41	.43909	.43013	.42150	.41317	.40514	.39739	.38990	.38267	.37568	.36892
42	.43272	.42379	.41519	.40690	.39890	.39119	.38374	.37655	.36960	.36289
43	.42652	.41762	.40905	.40079	.39283	.38516	.37775	.37061	.36371	.35704
44	.42047	.41160	.40307	.39485	.38693	.37930	.37194	.36483	.35798	.35136
45	.41457	.40574	.39724	.38906	.38118	.37359	.36628	.35922	.35241	.34584
46	.40882	.40003	.39157	.38343	.37559	.36805	.36078	.35377	.34700	.34048
47	.40322	.39445	.38603	.37794	.37015	.36265	.35542	.34846	.34175	.33527
48	.39774	.38902	.38064	.37259	.36484	.35739	.35021	.34330	.33663	.33021
49	.39240	.38372	.37539	.36738	.35968	.35227	.34514	.33828	.33166	.32528
50	.38719	.37855	.37026	.36230	.35464	.34728	.34020	.33339	.32682	.32049

DISCOUNTED TAX CREDIT
SUM OF DIGITS DEPRECIATION

INTEREST RATE
(% PER YEAR)

DEPRECIATION PERIOD

YEARS	10.00	10.25	10.50	10.75	11.00	11.25	11.50	11.75	12.00	12.25
3	.85525	.85212	.84901	.84592	.84286	.83981	.83678	.83378	.83079	.82782
4	.83015	.82655	.82299	.31946	.81596	.81248	.80903	.80561	.80221	.79884
5	.80614	.80215	.79819	.79426	.79037	.78651	.78268	.77889	.77512	.77139
6	.78321	.77884	.77452	.77024	.76600	.76180	.75764	.75352	.74944	.74540
7	.76126	.75658	.75194	.74734	.74279	.73829	.73384	.72943	.72507	.72076
8	.74030	.73531	.73037	.72550	.72068	.71591	.71120	.70654	.70194	.69738
9	.72022	.71496	.70977	.70465	.69959	.69459	.68965	.68477	.67995	.67519
10	.70099	.69550	.69008	.68474	.67947	.67426	.66913	.66406	.65906	.65412
11	.68257	.67687	.67125	.66572	.66026	.65488	.64957	.64434	.63918	.63409
12	.66491	.65903	.65324	.64754	.64192	.63638	.63093	.62555	.62026	.61504
13	.64798	.64194	.63600	.63015	.62439	.61872	.61314	.60765	.60224	.59691
14	.63174	.62556	.61949	.61351	.60763	.60185	.59616	.59057	.58507	.57965
15	.61616	.60986	.60366	.59758	.59160	.58572	.57995	.57427	.56869	.56320
16	.60120	.59479	.58850	.58232	.57626	.57030	.56445	.55871	.55306	.54752
17	.58685	.58033	.57396	.56770	.56157	.55555	.54964	.54384	.53815	.53256
18	.57302	.56645	.56000	.55369	.54750	.54142	.53547	.52963	.52390	.51827
19	.55974	.55311	.54661	.54024	.53401	.52789	.52190	.51603	.51027	.50463
20	.54697	.54029	.53375	.52734	.52107	.51493	.50891	.50302	.49724	.49159
21	.53469	.52796	.52139	.51495	.50866	.50249	.49646	.49056	.48478	.47912
22	.52286	.51611	.50951	.50305	.49674	.49057	.48453	.47862	.47284	.46718
23	.51146	.50470	.49808	.49162	.48530	.47912	.47308	.46717	.46140	.45575
24	.50051	.49372	.48709	.48062	.47430	.46812	.46209	.45620	.45044	.44480
25	.48994	.48314	.47651	.47004	.46373	.45756	.45154	.44566	.43992	.43431
26	.47975	.47295	.46633	.45986	.45356	.44741	.44141	.43555	.42983	.42424
27	.46991	.46313	.45651	.45006	.44378	.43765	.43167	.42583	.42014	.41458
28	.46043	.45365	.44705	.44062	.43436	.42825	.42230	.41649	.41083	.40530
29	.45127	.44451	.43793	.43153	.42529	.41921	.41328	.40751	.40188	.39639
30	.44243	.43569	.42914	.42275	.41654	.41050	.40461	.39887	.39328	.38783
31	.43389	.42718	.42065	.41430	.40812	.40210	.39625	.39055	.38500	.37959
32	.42564	.41895	.41245	.40613	.39999	.39401	.38820	.38254	.37703	.37166
33	.41766	.41100	.40454	.39825	.39215	.38621	.38044	.37482	.36935	.36403
34	.40994	.40332	.39689	.39065	.38458	.37866	.37295	.36738	.36195	.35668
35	.40247	.39589	.38950	.38329	.37727	.37142	.36573	.36020	.35482	.34959
36	.39525	.38870	.38235	.37619	.37021	.36440	.35876	.35327	.34794	.34276
37	.38825	.38175	.37544	.36932	.36338	.35762	.35202	.34659	.34130	.33617
38	.38148	.37501	.36875	.36267	.35678	.35107	.34552	.34013	.33490	.32981
39	.37491	.36849	.36227	.35624	.35040	.34473	.33923	.33389	.32871	.32367
40	.36855	.36217	.35600	.35002	.34422	.33860	.33315	.32786	.32273	.31774
41	.36238	.35605	.34993	.34399	.33824	.33267	.32727	.32203	.31694	.31201
42	.35640	.35012	.34404	.33815	.33245	.32693	.32158	.31639	.31135	.30647
43	.35059	.34436	.33833	.33249	.32684	.32137	.31607	.31093	.30594	.30110
44	.34496	.33877	.33279	.32701	.32141	.31598	.31073	.30564	.30070	.29592
45	.33949	.33335	.32742	.32169	.31614	.31076	.30556	.30052	.29563	.29089
46	.33418	.32809	.32221	.31652	.31102	.30570	.30055	.29556	.29072	.28603
47	.32902	.32298	.31715	.31152	.30606	.30079	.29569	.29074	.28596	.28132
48	.32401	.31802	.31224	.30665	.30125	.29603	.29097	.28608	.28134	.27675
49	.31915	.31320	.30746	.30193	.29658	.29140	.28640	.28155	.27686	.27232
50	.31439	.30851	.30283	.29734	.29204	.28691	.28196	.27716	.27252	.26802

DISCOUNTED TAX CREDIT
DOUBLE DECLINING/ STRAIGHT LINE DEPRECIATION

INTEREST RATE
(% PER YEAR)

DEPRECIATION PERIOD

YEARS	.00	.25	.50	.75	1.00	1.25	1.50	1.75	2.00	2.25
3	1.00000	.99640	.99283	.98928	.98575	.98225	.97877	.97532	.97189	.96848
4	1.00000	.99533	.99071	.98612	.98157	.97706	.97259	.96816	.96376	.95940
5	1.00000	.99432	.98870	.98313	.97762	.97216	.96676	.96142	.95613	.95089
6	1.00000	.99328	.98664	.98008	.97359	.96718	.96085	.95458	.94839	.94227
7	1.00000	.99228	.98466	.97714	.96972	.96240	.95517	.94804	.94100	.93406
8	1.00000	.99125	.98263	.97414	.96578	.95754	.94942	.94141	.93353	.92575
9	1.00000	.99025	.98067	.97124	.96196	.95284	.94386	.93502	.92633	.91777
10	1.00000	.98924	.97867	.96828	.95809	.94807	.93823	.92856	.91906	.90973
11	1.00000	.98824	.97671	.96540	.95432	.94344	.93277	.92230	.91203	.90196
12	1.00000	.98723	.97473	.96249	.95050	.93876	.92726	.91600	.90496	.89415
13	1.00000	.98624	.97278	.95963	.94677	.93420	.92190	.90987	.89810	.88658
14	1.00000	.98523	.97082	.95675	.94301	.92960	.91650	.90371	.89121	.87900
15	1.00000	.98424	.96888	.95392	.93933	.92510	.91123	.89770	.88451	.87163
16	1.00000	.98324	.96693	.95106	.93561	.92058	.90594	.89168	.87779	.86426
17	1.00000	.98225	.96501	.94826	.93197	.91615	.90076	.88580	.87124	.85708
18	1.00000	.98125	.96307	.94543	.92831	.91170	.89557	.87991	.86469	.84992
19	1.00000	.98027	.96116	.94265	.92471	.90733	.89048	.87414	.85830	.84292
20	1.00000	.97927	.95923	.93985	.92110	.90295	.88538	.86838	.85190	.83595
21	1.00000	.97629	.95733	.93709	.91754	.89865	.88039	.86273	.84565	.82913
22	1.00000	.97730	.95542	.93432	.91397	.89434	.87538	.85709	.83942	.82234
23	1.00000	.97632	.95353	.93159	.91046	.89010	.87047	.85156	.83331	.81571
24	1.00000	.97534	.95163	.92885	.90693	.88585	.86556	.84603	.82722	.80910
25	1.00000	.97436	.94976	.92614	.90346	.88168	.86074	.84061	.82125	.80263
26	1.00000	.97338	.94787	.92342	.89998	.87750	.85592	.83520	.81531	.79619
27	1.00000	.97240	.94600	.92074	.89655	.87338	.85118	.82989	.80948	.78989
28	1.00000	.97142	.94413	.91805	.89311	.86926	.84644	.82459	.80367	.78362
29	1.00000	.97045	.94227	.91539	.88972	.86521	.84178	.81939	.79797	.77747
30	1.00000	.96947	.94041	.91272	.88633	.86115	.83713	.81420	.79230	.77136
31	1.00000	.96851	.93857	.91008	.88297	.85716	.83256	.80910	.78673	.76538
32	1.00000	.96753	.93672	.90744	.87962	.85316	.82799	.80402	.78119	.75942
33	1.00000	.96657	.93488	.90483	.87631	.84922	.82349	.79902	.77574	.75359
34	1.00000	.96560	.93304	.90221	.87299	.84529	.81900	.79404	.77033	.74779
35	1.00000	.96464	.93122	.89962	.86972	.84141	.81458	.78914	.76501	.74209
36	1.00000	.96367	.92939	.89703	.86645	.83753	.81017	.78427	.75972	.73644
37	1.00000	.96271	.92758	.89446	.86321	.83371	.80583	.77947	.75452	.73089
38	1.00000	.96175	.92576	.89189	.85998	.82989	.80150	.77469	.74934	.72538
39	1.00000	.96079	.92396	.88935	.85678	.82612	.79723	.76998	.74426	.71996
40	1.00000	.95983	.92216	.88680	.85359	.82236	.79297	.76529	.73920	.71459
41	1.00000	.95888	.92037	.88428	.85043	.81865	.78878	.76068	.73423	.70931
42	1.00000	.95792	.91858	.88176	.84727	.81494	.78459	.75609	.72929	.70407
43	1.00000	.95697	.91680	.87926	.84415	.81128	.78047	.75157	.72443	.69891
44	1.00000	.95601	.91501	.87676	.84103	.80762	.77636	.74707	.71959	.69380
45	1.00000	.95506	.91325	.87428	.83794	.80402	.77230	.74263	.71484	.68878
46	1.00000	.95411	.91147	.87161	.83486	.80042	.76826	.73822	.71011	.68379
47	1.00000	.95317	.90972	.86935	.83181	.79686	.76428	.73387	.70546	.67888
48	1.00000	.95222	.90795	.86690	.82877	.79331	.76031	.72955	.70084	.67402
49	1.00000	.95128	.90621	.86446	.82575	.78981	.75639	.72528	.69629	.66923
50	1.00000	.95033	.90446	.86203	.82274	.78631	.75249	.72104	.69177	.66448

DISCOUNTED TAX CREDIT
DOUBLE DECLINING/STRAIGHT LINE DEPRECIATION

DEPRECIATION PERIOD

	INTEREST RATE (% PER YEAR)									
YEARS	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75
3	.96510	.96174	.95840	.95508	.95179	.94851	.94526	.94203	.93882	.93563
4	.95508	.95079	.94654	.94232	.93814	.93400	.92988	.92580	.92176	.91775
5	.94570	.94056	.93547	.93043	.92544	.92050	.91561	.91077	.90597	.90121
6	.93622	.93024	.92433	.91848	.91270	.90698	.90133	.89574	.89021	.88475
7	.92720	.92043	.91374	.90714	.90063	.89419	.88784	.88156	.87537	.86925
8	.91809	.91054	.90309	.89576	.88852	.88138	.87435	.86741	.86057	.85382
9	.90935	.90106	.89290	.88486	.87695	.86917	.86150	.85395	.84651	.83919
10	.90055	.89154	.88267	.87396	.86540	.85697	.84869	.84055	.83254	.82467
11	.89207	.88236	.87283	.86348	.85430	.84528	.83643	.82774	.81920	.81081
12	.88356	.87317	.86300	.85302	.84324	.83365	.82425	.81503	.80598	.79711
13	.87532	.86429	.85350	.84293	.83259	.82246	.81254	.80283	.79331	.78399
14	.86708	.85542	.84402	.83288	.82199	.81134	.80093	.79074	.78078	.77103
15	.85907	.84681	.83485	.82317	.81176	.80062	.78974	.77912	.76874	.75859
16	.85108	.83823	.82571	.81351	.80160	.78999	.77867	.76762	.75684	.74633
17	.84331	.82990	.81685	.80414	.79177	.77972	.76798	.75654	.74539	.73453
18	.83556	.82160	.80804	.79485	.78202	.76955	.75741	.74560	.73410	.72291
19	.82801	.81353	.79948	.78583	.77257	.75970	.74719	.73503	.72321	.71171
20	.82049	.80550	.79097	.77688	.76321	.74996	.73709	.72460	.71247	.70069
21	.81315	.79768	.78269	.76819	.75413	.74051	.72731	.71451	.70210	.69006
22	.80585	.78990	.77449	.75957	.74514	.73118	.71766	.70457	.69189	.67960
23	.79872	.78232	.76648	.75119	.73641	.72212	.70830	.69494	.68201	.66950
24	.79163	.77479	.75855	.74288	.72777	.71317	.69907	.68545	.67229	.65957
25	.78470	.76744	.75082	.73480	.71936	.70447	.69011	.67626	.66288	.64997
26	.77782	.76015	.74315	.72680	.71105	.69589	.68128	.66720	.65362	.64053
27	.77108	.75303	.73568	.71900	.70297	.68755	.67270	.65841	.64465	.63139
28	.76439	.74596	.72827	.71129	.69498	.67931	.66425	.64976	.63583	.62241
29	.75785	.73905	.72104	.70376	.68720	.67129	.65603	.64136	.62727	.61372
30	.75135	.73220	.71387	.69632	.67951	.66339	.64793	.63309	.61885	.60517
31	.74496	.72550	.70688	.68906	.67201	.65569	.64005	.62506	.61068	.59689
32	.73867	.71886	.69995	.68188	.66461	.64809	.63229	.61715	.60265	.58875
33	.73246	.71236	.69318	.67487	.65739	.64069	.62473	.60946	.59485	.58086
34	.72634	.70592	.68648	.66794	.65027	.63340	.61729	.60190	.58718	.57311
35	.72032	.69962	.67992	.66117	.64331	.62628	.61004	.59454	.57973	.56558
36	.71435	.69337	.67344	.65448	.63645	.61927	.60290	.58730	.57240	.55818
37	.70849	.68725	.66709	.64794	.62974	.61243	.59595	.58024	.56528	.55100
38	.70269	.68119	.66082	.64148	.62313	.60568	.58909	.57331	.55827	.54395
39	.69699	.67525	.65467	.63516	.61666	.59910	.58241	.56655	.55146	.53709
40	.69134	.66937	.64859	.62892	.61028	.59261	.57584	.55990	.54476	.53035
41	.68580	.66361	.64264	.62282	.60405	.58627	.56942	.55343	.53824	.52380
42	.68030	.65790	.63676	.61678	.59790	.58003	.56310	.54705	.53183	.51736
43	.67491	.65230	.63099	.61088	.59189	.57393	.55693	.54084	.52558	.51110
44	.66956	.64676	.62529	.60505	.58595	.56791	.55086	.53472	.51944	.50495
45	.66431	.64132	.61970	.59934	.58015	.56204	.54493	.52876	.51345	.49895
46	.65911	.63594	.61418	.59370	.57442	.55625	.53909	.52289	.50757	.49307
47	.65400	.63066	.60876	.58818	.56882	.55058	.53339	.51717	.50183	.48733
48	.64895	.62544	.60340	.58272	.56329	.54500	.52778	.51153	.49620	.48170
49	.64395	.62030	.59815	.57738	.55788	.53954	.52229	.50603	.49069	.47621
50	.63902	.61523	.59296	.57210	.55254	.53416	.51688	.50062	.48528	.47081

DISCOUNTED TAX CREDIT
DOUBLE DECLINING/ STRAIGHT LINE DEPRECIATION

INTEREST RATE
(% PER YEAR)

DEPRECIATION PERIOD

YEARS	5.00	5.25	5.50	5.75	6.00	6.25	6.50	6.75	7.00	7.25
3	.93246	.92932	.92619	.92309	.92000	.91693	.91389	.91086	.90785	.90486
4	.91377	.90982	.90590	.90202	.89816	.89434	.89054	.88678	.88305	.87934
5	.89650	.89184	.88722	.88265	.87811	.87362	.86917	.86477	.86040	.85607
6	.87934	.87399	.86870	.86347	.85829	.85317	.84810	.84309	.83813	.83323
7	.86320	.85723	.85134	.84551	.83976	.83407	.82846	.82291	.81742	.81201
8	.84717	.84061	.83413	.82775	.82145	.81523	.80910	.80304	.79707	.79118
9	.83197	.82487	.81787	.81097	.80418	.79748	.79089	.78439	.77798	.77166
10	.81692	.80930	.80180	.79442	.78716	.78002	.77299	.76608	.75927	.75257
11	.80256	.79448	.78653	.77872	.77104	.76349	.75607	.74878	.74161	.73457
12	.78840	.77986	.77148	.76326	.75519	.74726	.73949	.73185	.72435	.71699
13	.77485	.76590	.75713	.74853	.74011	.73184	.72374	.71580	.70801	.70036
14	.76149	.75215	.74301	.73407	.72531	.71673	.70833	.70011	.69205	.68415
15	.74866	.73898	.72951	.72025	.71119	.70233	.69366	.68518	.67689	.66877
16	.73606	.72603	.71625	.70669	.69735	.68823	.67932	.67061	.66210	.65378
17	.72394	.71361	.70353	.69371	.68412	.67477	.66564	.65672	.64802	.63953
18	.71201	.70140	.69106	.68098	.67117	.66160	.65227	.64318	.63430	.62565
19	.70053	.68966	.67908	.66878	.65876	.64900	.63949	.63023	.62121	.61242
20	.68925	.67813	.66733	.65683	.64661	.63668	.62702	.61761	.60846	.59955
21	.67836	.66704	.65603	.64534	.63496	.62487	.61507	.60554	.59628	.58726
22	.66770	.65615	.64496	.63410	.62357	.61334	.60341	.59377	.58441	.57531
23	.65739	.64566	.63430	.62329	.61261	.60227	.59223	.58249	.57305	.56387
24	.64727	.63537	.62385	.61270	.60191	.59145	.58132	.57150	.56198	.55275
25	.63749	.62543	.61378	.60251	.59160	.58106	.57084	.56096	.55138	.54210
26	.62789	.61569	.60391	.59253	.58154	.57091	.56062	.55068	.54105	.53174
27	.61861	.60628	.59439	.58291	.57183	.56113	.55080	.54080	.53114	.52179
28	.60950	.59706	.58507	.57351	.56236	.55160	.54121	.53118	.52149	.51212
29	.60066	.58814	.57606	.56442	.55321	.54240	.53198	.52192	.51221	.50283
30	.59203	.57939	.56724	.55554	.54428	.53343	.52298	.51290	.50318	.49380
31	.58365	.57093	.55871	.54695	.53565	.52477	.51430	.50421	.49448	.48511
32	.57542	.56263	.55035	.53856	.52722	.51632	.50583	.49574	.48602	.47665
33	.56745	.55460	.54227	.53044	.51908	.50816	.49767	.48757	.47786	.46851
34	.55963	.54673	.53436	.52250	.51112	.50019	.48970	.47961	.46991	.46058
35	.55204	.53909	.52669	.51481	.50342	.49249	.48200	.47193	.46225	.45294
36	.54460	.53161	.51918	.50729	.49589	.48497	.47449	.46444	.45478	.44551
37	.53737	.52435	.51191	.50000	.48861	.47769	.46723	.45720	.44757	.43833
38	.53026	.51724	.50478	.49287	.48149	.47059	.46015	.45014	.44055	.43134
39	.52339	.51033	.49787	.48596	.47459	.46370	.45329	.44332	.43376	.42459
40	.51663	.50356	.49110	.47920	.46784	.45698	.44660	.43666	.42714	.41801
41	.51006	.49699	.48452	.47264	.46130	.45047	.44012	.43021	.42073	.41165
42	.50362	.49054	.47809	.46622	.45491	.44411	.43379	.42393	.41449	.40546
43	.49735	.48427	.47183	.45999	.44870	.43793	.42766	.41784	.40845	.39946
44	.49119	.47813	.46571	.45389	.44263	.43190	.42167	.41189	.40255	.39361
45	.48520	.47215	.45975	.44796	.43674	.42605	.41585	.40613	.39683	.38795
46	.47933	.46629	.45392	.44216	.43098	.42033	.41018	.40050	.39126	.38243
47	.47360	.46059	.44825	.43652	.42537	.41477	.40467	.39504	.38585	.37707
48	.46799	.45500	.44269	.43100	.41989	.40933	.39928	.38970	.38057	.37185
49	.46251	.44955	.43727	.42562	.41456	.40405	.39405	.38453	.37545	.36678
50	.45714	.44421	.43197	.42036	.40935	.39889	.38894	.37947	.37044	.36184

DISCOUNTED TAX CREDIT
DOUBLE DECLINING/ STRAIGHT LINE DEPRECIATION

INTEREST RATE
(% PER YEAR)

DEPRECIATION PERIOD

YEARS	7.50	7.75	8.00	8.25	8.50	8.75	9.00	9.25	9.50	9.75
3	.90189	.89894	.89601	.89309	.89020	.88732	.88446	.88162	.87879	.87598
4	.87567	.87202	.86841	.86482	.86125	.85772	.85421	.85073	.84728	.84385
5	.85179	.84754	.84333	.83916	.83503	.83093	.82687	.82285	.81886	.81491
6	.82837	.82357	.81882	.81412	.80946	.80486	.80030	.79579	.79132	.78690
7	.80665	.80136	.79613	.79096	.78586	.78081	.77582	.77089	.76601	.76119
8	.78537	.77963	.77396	.76837	.76285	.75740	.75202	.74671	.74147	.73629
9	.76544	.75931	.75326	.74730	.74142	.73562	.72991	.72427	.71871	.71323
10	.74597	.73947	.73308	.72678	.72058	.71447	.70846	.70253	.69669	.69095
11	.72764	.72082	.71412	.70753	.70105	.69467	.68840	.68223	.67615	.67018
12	.70970	.70266	.69568	.68883	.68210	.67548	.66898	.66259	.65631	.65014
13	.69287	.68551	.67830	.67121	.66426	.65744	.65075	.64417	.63772	.63138
14	.67641	.66883	.66140	.65412	.64698	.63998	.63311	.62638	.61978	.61330
15	.66082	.65304	.64542	.63797	.63066	.62351	.61650	.60963	.60291	.59631
16	.64565	.63769	.62991	.62230	.61486	.60757	.60044	.59347	.58663	.57995
17	.63125	.62312	.61520	.60746	.59990	.59250	.58527	.57820	.57129	.56452
18	.61721	.60897	.60093	.59308	.58541	.57793	.57061	.56347	.55649	.54967
19	.60386	.59550	.58736	.57942	.57167	.56411	.55673	.54953	.54250	.53563
20	.59086	.58243	.57420	.56618	.55837	.55075	.54332	.53608	.52901	.52211
21	.57850	.56997	.56167	.55359	.54572	.53805	.53059	.52331	.51622	.50931
22	.56647	.55787	.54951	.54139	.53348	.52578	.51829	.51099	.50389	.49697
23	.55497	.54632	.53792	.52975	.52181	.51409	.50659	.49928	.49218	.48526
24	.54380	.53511	.52667	.51848	.51052	.50279	.49528	.48798	.48088	.47397
25	.53310	.52438	.51592	.50771	.49975	.49201	.48451	.47721	.47012	.46323
26	.52271	.51397	.50550	.49728	.48932	.48159	.47409	.46681	.45974	.45288
27	.51275	.50399	.49552	.48730	.47934	.47163	.46415	.45689	.44985	.44301
28	.50307	.49431	.48583	.47763	.46969	.46199	.45453	.44730	.44029	.43349
29	.49377	.48502	.47655	.46836	.46044	.45277	.44534	.43814	.43116	.42440
30	.48474	.47600	.46755	.45938	.45148	.44384	.43644	.42928	.42234	.41562
31	.47606	.46733	.45890	.45076	.44289	.43528	.42792	.42080	.41391	.40723
32	.46762	.45891	.45051	.44240	.43456	.42699	.41967	.41260	.40575	.39912
33	.45950	.45081	.44244	.43436	.42657	.41904	.41176	.40473	.39793	.39136
34	.45160	.44255	.43461	.42657	.41882	.41133	.40410	.39712	.39037	.38385
35	.44399	.43537	.42707	.41907	.41136	.40392	.39675	.38981	.38312	.37664
36	.43659	.42801	.41975	.41180	.40413	.39674	.38962	.38274	.37609	.36968
37	.42945	.42091	.41269	.40479	.39717	.38983	.38276	.37593	.36935	.36298
38	.42250	.41400	.40584	.39798	.39041	.38313	.37611	.36934	.36281	.35650
39	.41579	.40734	.39922	.39141	.38390	.37667	.36971	.36299	.35652	.35027
40	.40926	.40086	.39279	.38504	.37758	.37040	.36349	.35684	.35042	.34423
41	.40295	.39460	.38658	.37888	.37148	.36436	.35750	.35090	.34454	.33841
42	.39680	.38850	.38054	.37289	.36555	.35848	.35169	.34515	.33884	.33277
43	.39086	.38261	.37470	.36711	.35982	.35281	.34608	.33959	.33335	.32733
44	.38506	.37687	.36902	.36148	.35425	.34730	.34062	.33420	.32801	.32205
45	.37945	.37132	.36352	.35604	.34887	.34198	.33535	.32899	.32286	.31695
46	.37399	.36591	.35817	.35075	.34363	.33680	.33023	.32392	.31785	.31200
47	.36869	.36066	.35298	.34562	.33856	.33179	.32528	.31902	.31301	.30722
48	.36352	.35555	.34793	.34063	.33363	.32691	.32046	.31426	.30831	.30257
49	.35851	.35060	.34303	.33579	.32885	.32219	.31579	.30965	.30375	.29807
50	.35362	.34577	.33826	.33108	.32419	.31759	.31125	.30517	.29932	.29370

DISCOUNTED TAX CREDIT
DOUBLE DECLINING/STRAIGHT LINE DEPRECIATION

INTEREST RATE
(% PER YEAR)

DEPRECIATION PERIOD

YEARS	10.00	10.25	10.50	10.75	11.00	11.25	11.50	11.75	12.00	12.25
3	.87319	.87042	.86767	.86493	.86220	.85950	.85681	.85414	.85148	.84884
4	.84045	.83707	.83372	.83040	.82710	.82382	.82057	.81734	.81414	.81096
5	.81100	.80712	.80327	.79946	.79568	.79193	.78822	.78453	.78088	.77726
6	.78253	.77819	.77391	.76966	.76546	.76130	.75718	.75311	.74907	.74507
7	.75642	.75171	.74705	.74245	.73789	.73339	.72893	.72453	.72017	.71586
8	.73116	.72613	.72115	.71622	.71136	.70656	.70181	.69713	.69250	.68792
9	.70785	.70249	.69723	.69204	.68692	.68187	.67689	.67197	.66711	.66232
10	.68526	.67970	.67420	.66878	.66344	.65818	.65299	.64788	.64284	.63787
11	.66430	.65851	.65281	.64720	.64168	.63624	.63089	.62562	.62043	.61531
12	.64407	.63810	.63224	.62647	.62079	.61521	.60973	.60433	.59901	.59379
13	.62516	.61904	.61304	.60714	.60134	.59564	.59005	.58455	.57914	.57382
14	.60694	.60071	.59459	.58858	.58269	.57690	.57122	.56564	.56016	.55478
15	.58985	.58351	.57730	.57121	.56524	.55938	.55364	.54800	.54247	.53704
16	.57340	.56698	.56070	.55455	.54852	.54261	.53682	.53114	.52557	.52012
17	.55791	.55143	.54510	.53889	.53282	.52688	.52106	.51535	.50977	.50430
18	.54300	.53648	.53011	.52388	.51778	.51181	.50597	.50026	49467	.48919
19	.52895	.52238	.51598	.50973	.50362	.49764	.49180	.48608	.48050	.47503
20	.51539	.50882	.50241	.49615	.49003	.48406	.47823	.47252	.46695	.46150
21	.50257	.49599	.48958	.48332	.47721	.47125	.46543	.45975	.45419	.44877
22	.49023	.48366	.47725	.47101	.46491	.45897	.45317	.44752	.44199	.43660
23	.47852	.47196	.46557	.45934	.45328	.44736	.44159	.43596	.43047	.42512
24	.46725	.46071	.45434	.44814	.44210	.43622	.43048	.42490	.41945	.41413
25	.45653	.45002	.44368	.43751	.43150	.42566	.41996	.41441	.40901	.40374
26	.44621	.43972	.43342	.42728	.42132	.41552	.40986	.40436	.39900	.39378
27	.43637	.42992	.42365	.41756	.41164	.40588	.40028	.39482	.38951	.38434
28	.42689	.42048	.41425	.40821	.40233	.39662	.39107	.38566	.38041	.37529
29	.41784	.41147	.40529	.39929	.39347	.38781	.38230	.37695	.37175	.36669
30	.40911	.40279	.39666	.39071	.38493	.37933	.37388	.36858	.36343	.35843
31	.40076	.39449	.38841	.38251	.37679	.37124	.36584	.36060	.35551	.35056
32	.39270	.38648	.38046	.37462	.36895	.36345	.35811	.35293	.34789	.34300
33	.38499	.37882	.37285	.36706	.36145	.35601	.35072	.34560	.34062	.33578
34	.37753	.37142	.36551	.35977	.35422	.34883	.34361	.33854	.33362	.32884
35	.37039	.36433	.35847	.35279	.34729	.34196	.33680	.33178	.32692	.32220
36	.36347	.35748	.35167	.34605	.34061	.33534	.33023	.32527	.32047	.31580
37	.35684	.35089	.34515	.33959	.33420	.32899	.32393	.31903	.31428	.30967
38	.35041	.34453	.33884	.33334	.32801	.32285	.31786	.31301	.30832	.30377
39	.34424	.33841	.33278	.32733	.32206	.31696	.31202	.30723	.30259	.29809
40	.33825	.33248	.32691	.32152	.31631	.31127	.30638	.30165	.29707	.29262
41	.33249	.32678	.32126	.31593	.31078	.30579	.30096	.29628	.29175	.28736
42	.32691	.32126	.31580	.31052	.30542	.30049	.29571	.29109	.28662	.28228
43	.32153	.31593	.31052	.30531	.30026	.29538	.29066	.28609	.28167	.27738
44	.31631	.31076	.30542	.30025	.29526	.29044	.28577	.28126	.27689	.27265
45	.31126	.30578	.30049	.29538	.29044	.28567	.28106	.27659	.27227	.26809
46	.30637	.30094	.29571	.29065	.28577	.28105	.27649	.27208	.26781	.26367
47	.30164	.29627	.29109	.28609	.28126	.27659	.27208	.26772	.26349	.25940
48	.29705	.29173	.28660	.28165	.27688	.27226	.26780	.26349	.25931	.25527
49	.29261	.28734	.28226	.27737	.27264	.26808	.26366	.25940	.25527	.25128
50	.28829	.28307	.27805	.27321	.26853	.26401	.25965	.25543	.25135	.24740

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